

# **Business Process Modelling for Academic Libraries**

**By**

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## DECLARATION

This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

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*This work is dedicated to my father*

## Abstract

This study examines business process modelling for academic libraries. **Background:** Pressures on commercial organisations to be more efficient and effective in their information management have led to interest in the modelling of business processes, to help ensure that information systems – manual and computerised – genuinely support effective operations. Academic libraries have seen huge changes with the growth of the Internet and easier access to information, but examination of library functions and activities, in terms of process architecture has been limited. **Aims and objectives:** This research investigates academic library processes using a business process modelling method called Riva. The university libraries selected are four cases from two contrasting sites: Jordan and the UK. **Methods:** The literature review covered academic libraries and their history, the concept of role, operational research and business process modelling. Interviews with library staff ( $n = 47$ ) were conducted, to learn about library processes. After analysing the information gathered, with consultation of documents, a Process Architecture Diagram and a set of Role Activity Diagrams for selected functions were derived. **Results:** Models of RADs were provided, demonstrating the processes selected. A comparison between the two sites in terms of application of these processes along with their associated challenges was also provided. Improvements could be extracted from the process models, as they pinpointed some inefficiencies and also helped to raise questions about procedures through comparisons. **Conclusions:** It seems fair to conclude that the modelling technique used was feasible, as it was able to visualize processes within academic libraries and provide a basis for improvement and management by supporting the analysis of process performance and behaviour. A limitation to this method is that library managers might need to learn new techniques

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## List of Abbreviations

AACR1	Anglo-American Cataloguing Rules 1
AACR2	Anglo-American Cataloguing Rules 2
ABI	Abstracted Business Information
ACM	Association for Computing Machinery
ALA	American Library Association
ALT	Academic Liaison Team
ANT	Actor-Network Theory
APA	American Psychological Association
ARL	Association of Research Libraries
ASLIB	Association of Special Libraries and Information Bureau
BPM	Business Process Modelling
BPMI	Business Process Modelling Initiative
BPMN	Business Process Modelling Notations
BPR	Business Process Reengineering
CACUL	Canadian Association of College and University Libraries
CIG	Cataloguing and Indexing Group
CILIP	Chartered Institute of Library and Information Professionals
CLA	Copyright Licencing Agency
CMP	Case Management Process

COJC	Committee on Journal Cancellations
CP	Case Process
CSCW	Computer Supported Cooperative Work
CSIC	Consejo Superior de Investigaciones Científicas
CURL	Consortium of University Research Libraries
CVD	Customer Value Discovery
DFD	Data Flow Diagram
EBE	Essential Business Entity
EBSCO	Elton B. Stephens Company
EDI	Electronic Data Interchange
ELTI	Embedding Learning Technologies Institutionally
eMM	E-Learning Maturity Model
EQLIPSE	Evaluation and Quality in Library Performance: System for Europe
ESRC	Economic and Social Research Council
ETDs	Electronic Theses and Dissertations
EThOS	Electronic Theses Online Services
FRBR	Functional Requirements for Bibliographic Records
FRE	Framework for Research Ethics
HEA	Higher Education Academy
HEFCE	Higher Education Funding Council for England

HERON	Higher Education Resources ON-demand
HFE	Hussein Fund for Excellence
IDEF	Integration DEFinition
IMF	International Monetary Fund
IS	Information Systems
ISA	Information Services Activity
ISI	Institute for Scientific Information
JISC	Joint Information Systems Committee
JO1	The first case study (Jordanian University)
JO2	The second case study (Jordanian University)
JSTOR	Journal Storage
JUSTEIS	JISC Usage Surveys Trends in Electronic Information Services
LCSH	Library of Congress Subject Headings
LIRG	Library and Information Research Group
LISA	Library and Information Science Abstracts
LISTA	Library, Information Science and Technology Abstracts
MARC	Machine-Readable Cataloguing
MCC	Microelectronics and Computer Consortium
MDA	Model Driven Architecture
MIT90s	Management in The 90s



OCR	Optical Character Recognition
ORCA	Object Requirements Capture Analysis
PAD	Process Architecture Diagram
PDA	Patron Driven Acquisition
PEST	Political, Economic, Social and Technological
RAD	Role Activity Diagram
REF	Research Excellence Framework
RSCs	Regional Support Centres
RINs	Role Interaction Nets
RSP	Repositories Support Project
SCONUL	Society of College, National and University Libraries
SEM	Strategic Enterprise Management
SPICE	Software Process Improvement and Capability dEtermination
SSADM	Structured Systems Analysis and Design Methodology
SUNCAT	Serials Union Catalogue for the UK
TQM	Total Quality Management
UK1	The first case study (UK University)
UK2	The second case study (UK University)
UOW	Unit Of Work
UML	Unified Modelling Language

URL	Uniform Resource Locator
VAT	Value Added Tax
VLE	Virtual Learning Environment
WB	World Bank
WRAP	Warwick Research Archive Portal

# **1 Chapter One: Introduction**

## **1.1 Background**

The motivation for conducting this research study arose from earlier close involvement with one of the Jordanian libraries in the study. The problem there was improvement of processes, a problem that seemed to require knowledge about systems analysis and Business Process Modelling (BPM) to solve it. A possible methodology for examining and analysing processes came to light while studying a postgraduate Master's degree programme in Software Engineering. For the doctoral research, the funding was allocated to a topic in Library and Information Science. This provided the opportunity to apply personal interests in systems analysis and business process modelling, enhanced by the degree programme in Software Engineering, to a problem in library and information science. The university staff supported this idea, and preliminary literature searching showed that there was very little published on this topic, despite the extensive development of library management systems software. Much of this software does what much software does – automates existing functions, rather than requiring examination first whether the functionality has a purpose. The topic seemed timely as well as innovative.

## **1.2 Problem context**

The rise of technology has brought an information age that is heavily reliant on information and communication technology: "It is an age where the survival and development of humankind are ultimately defined by the use, production and consumption of information" (Ngulube, 2004). Academic libraries are important parts of this world, as organisations providing wealthy information resources. They support the institutional mission, their collections and services reflect changes in resources and research (Gannon-Leary, Bent and Webb, 2007).

During the past decades, the development of information technologies has been considered one of the most fundamental changes in the period. Consequently, the library environment and the nature of work within libraries have changed radically. In the knowledge economy, universities and colleges have a major role in knowledge creation, innovation, dissemination and in learning. Kiviniemi, Laitinen and Saarti (2009) state that it is worth investing in university libraries in an attempt to improve the knowledge economy. National economies are globalizing, and according to Carnoy (2005): “two of the main bases of globalization are information and innovation, and they, in turn, are highly knowledge intensive”.

Globalization in higher education means that universities are opening up campuses abroad, or offering distance learning courses to students in other regions or countries. The last decade has witnessed extensive expansion of higher education systems. Nations draw on different policies towards massification of higher education, to get more students prepared for the knowledge economy. In the UK, the Joint Information Systems Committee (JISC) expanded its role to cover support of further education in 2000, as more students were doing higher education programmes in further education colleges. The establishment of JISC Regional Support Centres (RSCs) aimed to connect colleges to the national academic network, and to provide advice on implementing the use of technology in colleges across the UK (JISC Advance, 2011). This support affected further education college libraries and the way they worked, which became closer to the way university libraries operated.

Although fewer changes in the academic library environment are taking place in Jordan, Younis (2005) emphasizes that academic libraries in Jordan are dealing mainly with the change of transition from print to electronic resources as a prime gateway to information sources. Automation of library management systems has also been an important aspect of development in Jordanian university libraries.

Competition within the higher education sector for funding, and more recent resource constraints mean that more attention than ever is being paid to

effective ways of working, and dealing with the changes in the new environment. Some of the chapter titles in a book edited by Sue McKnight (McKnight, 2010) outline some of the challenges that academic library managers perceive - redefining the service commitment, the challenge of citizen-created content, new publishing models, management of research data, adding value to learning and teaching. The literature review examines the situation for academic libraries in more detail, but a key theme is the management of change and embedding innovation in academic libraries and information services throughout this period of continuous change. In today's competitive world, change is an important aspect of any business lifespan, a business that does not continuously try to improve cannot expect to last long (Noran, 2000).

Atkinson (2003) asserted the continuous change within UK universities and their information services. Danshgar and Parirokh (2007) state that librarians should value the creation of knowledge and learning and use that to develop their institution. Traditional methods for managing change is probably not sufficient enough in this age of continuous change that academic libraries are facing, whether it is in the context of technology, user behaviour, electronic resources or publishing. Section 2.2.1 discusses the academic library response to changes in detail, but for this research, the gap to be filled here is examining library processes. Much of the work in the literature supports managing change and improving library services, but there is less emphasis on really rethinking what the library does. Little work refers to library activities, workflow and processes.

Nowadays, business organisations are being described in terms of processes rather than functional hierarchies. To be able to deal with change and improve libraries' functions and processes, business process modelling can be used to examine libraries' activities, and it can also help improve processes as it involves redesigning organisations to remove unnecessary communication, processing and duplication of data (Bond, 1999).

Riva – the method used to model processes in this research - is one example of a modelling and analysis method based on the concept of “role”. Ould

created and adopted the development of Riva method in the business process modelling field. Ould (2005) defines Riva as “a method for the elicitation, modelling, analysis and design of organisational processes”. Riva uses two visual languages to represent and discuss processes: the Process Architecture Diagram (PAD), which looks at the overall processes within an organisation, and the Role Activity Diagram (RAD), which is used to model individual processes.

### ***1.3 Research Question, Aim and objectives***

The research question is: how can business process modelling using Riva method visualize and improve university library processes?

The aim of this research is to focus on a business organisation (university academic library) to examine organisational processes using a business process modelling technique, Role Activity Diagram (RAD), with the main underlying purpose to improve library processes. Although the focus of the thesis is on university/higher education libraries, the broader term “academic library” is used frequently, especially in the literature review, since major processes such as acquisitions are common in university, college and school libraries. As previously noted, in the UK, JISC now supports higher and further education, higher education programmes are delivered in further education colleges, and the previous distinctions between university and further education libraries are becoming blurred.

This work bridges library science and information technology, by applying the Riva method as business process modelling technique to examine libraries’ processes. There are several business process modelling techniques but Riva is probably one of the most rigorous methods. Section 2.5 discusses various methods and justifies the use of Riva. The following chart describes the sequence of work of this thesis or areas of research that needs to be explored in an attempt to answer the research question, these are labelled from (A) to (F) to tie them later to the research sub-questions:

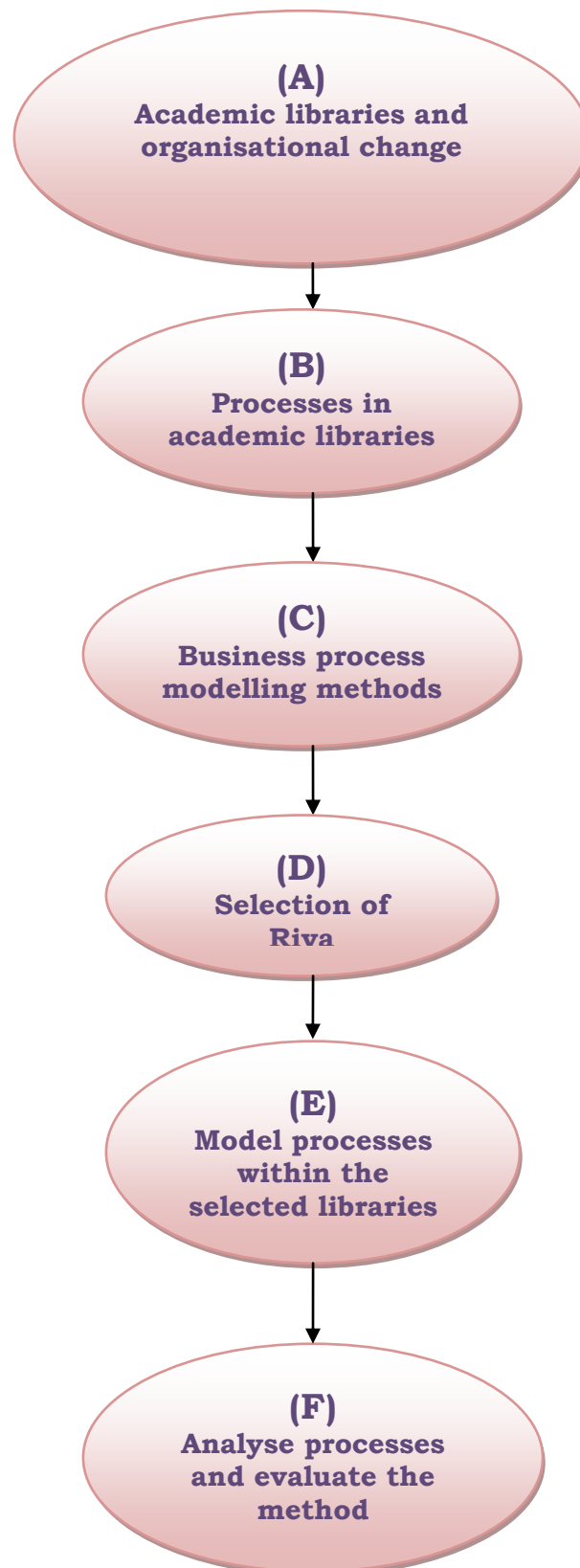


Figure 1.1 A chart describing the areas of research and problem context for this work

The objectives were to:

- Assess existing evidence on academic libraries and business process modelling, or related systems analysis methods
- Assess existing evidence on methods for change management in academic libraries that explicitly examine internal processes
- Review the scope of academic library processes, to make an informed choice about processes for more detailed analysis
- Examine the feasibility of using Riva as a business process modelling methodology in academic libraries, using four case study sites across two countries
- Consider possible improvements to processes from the models created
- Using case study design, examine comparisons between the selected sites, specially the two contrasting sites (Jordan vs. UK)
- Reflect on how the study's findings relate to Ould's claims about Riva

There are several sub-questions within the main aim, these are:

- *To what extent are academic libraries responding to change, and using performance measurement methods?* This sub-question is tied to ellipse (A) in figure 1.1
- *Why should RIVA be the BPM method used?* This is tied to (D)
- *How do some common library functions or processes relate to BPM processes?* This is tied to (B) and (C)
- *Is it feasible to apply RIVA to these library processes?* This is tied to (D) and (E)
- *Are the findings helpful in identifying possible actions for change and improvement?* This is tied to (F)



## **1.4 Structure of thesis**

This report is divided into ten chapters followed by a full list of bibliography along with a set of appendices. The referencing style used is APA (Online Writing Lab, 2012).

Chapter one provides an introduction about the study, introducing the research question and the aims and objectives.

Chapter two presents a literature review which embraces four main areas of interest, these are:

- Academic libraries: this main section provides an overview of academic libraries and their history, highlighting major recent changes, and demonstrating how academic libraries are responding to these changes
- Quality and performance measurement tools in academic libraries, in particular the various measurement methods adopted to evaluate library performance that are relevant to this research
- Business process modelling, providing a definition of BPM along with the related work in this field. The section also discusses the concept of role
- Modelling methods, as the last main section in the literature focuses on different frameworks for selecting the appropriate BPM approach, which leads to a justification for the use of RAD in this research

The purpose of chapter three is to introduce the methodology and tools used in this research to collect and analyse empirical evidence. The chapter contains an introduction about main research paradigms, an overview of different research strategies applied in social sciences focusing on case study design in particular as it is the research strategy selected for this research. It then introduces the data collection methods and tools used for collecting evidence for the cases selected and how they were analysed. Finally, it looks at the key ethical issues encountered during conduct of this research.

Chapter four describes the four cases selected for this research. It provides a general view of these libraries, a brief history, and an overview considering their aims, size and their organisational structure.

Chapter five comes next to describe the Riva method. It is divided into two distinct parts. The first part describes the first element of the Riva method, which is developing the Process Architecture Diagram (PAD). The second part describes the second element of Riva which is the Role Activity Diagram (RAD). At the end of the chapter, an overview of the tool used to model processes is presented and a summary of library processes in the four selected cases is listed.

Chapters six, seven and eight introduce the processes in the four selected libraries using RAD. The processes respectively are: material acquisitions in chapter six, cataloguing and classification in chapter seven, and binding, digitization and theses handling in chapter eight. Each chapter ends with a brief discussion about possible process improvements.

From the preliminary discussions presented in chapters six, seven and eight, an overall discussion complementing and developing the points already mentioned is provided in chapter nine. This chapter first justifies the processes selected, then examines how feasible Riva is as a modelling method. After that, the chapter presents all suggested improvements - revealed by RADs - according to the cases selected, rather than by type of improvements. This allows comparative analysis between the selected cases.

Finally, chapter ten contains conclusion, limitations of the research and implications for future research.

The appendices include two papers published during the research, one published in a peer reviewed journal, the other is in conference proceedings.

Also included in the appendices are the interview guides, one coding example, the consent form and the information letter distributed to interviewees, and finally, the documentary information and archival records used as data collection methods.

## **2 Chapter Two: Literature Review**

### **2.1 Introduction**

This chapter is linked to the first and second objectives in section 1.3. It presents a literature review which embraces four main parts:

- The first one provides an overview of academic libraries, their history and role as a major source of information. It examines operations research as it is related to the history of academic library operations and their activities. Finally, it highlights the major changes in academic libraries, together with the need for improvement.
- The second part provides an overview of some of the main UK and international initiatives related to performance measurement tools and techniques.
- Section 2.4 introduces BPM. It considers the concept of 'role' in general, and the librarians' role more specifically. The concept of role is very important in this research as the modelling tool (Role Activity Diagram) is based on it. This part then highlights the pitfalls of BPM.
- The last part compares different frameworks for selecting the appropriate BPM approach. It then introduces Riva briefly and demonstrates the application of RAD in the literature along with justification for the use of Riva in this research.

### **2.2 Academic Libraries**

According to Ranganathan's fifth law of library science (1963); the library is "a growing organism", which leads to the common belief that libraries are dynamic systems or organisms where information acquisition, collection and leverage are dynamic too. This means that not only knowledge should be processed, but also, new information and knowledge should be created

(Danshgar and Parirokh, 2007). This law hints at the crucial and lasting characteristics of libraries as evolving institutions, rather than referring to their functionalities.

Academic libraries have been described as a major source of information for researchers and many other users. They can be referred to as systems of integrated activities and business processes that collaborate together to achieve organisational goals (Danshgar and Parirokh, 2007). In academia the library is a supporting tool to the organisation's mission. The collections it embraces and the services it provides reflect changes and progress in research in that institution. In other words, academic libraries are usually dependent on their parent institutions, and have resultant characters and provide services based on their users' needs. Akeroyd (2001) describes an academic library in four distinctive ways: as a collection of resources, as a building or space, as a function (organisation of information) and as a service.

Ten years on, these themes are reflected in a book on the future of academic libraries (McKnight, 2010) although there are modifications. The emphasis is less on the collection of resources, more on the different ways in which content is generated and consumed. The idea of the library as a learning space endures. Walton (2006) concludes from his study at Loughborough University library that there are three broad emerging reasons for people to use the library: 1) to access resources; 2) to benefit from the learning space provision; and 3) to use the library as a studying atmosphere.

Increasingly that learning space is also digital, with the learning taking place online as well as studying in the library itself. The library's function around organisation of information remains but there are new responsibilities for curation and access. And now, more than ever, the library needs to provide a service to scholarship, learning and teaching.

Chaturvedi (1994) states that academic libraries along with their academic institutions play a major role in directing the cultural, political, social, scientific and technological development of a nation. In addition, the quality of academic libraries reflects the quality level of the institution it belongs to: "Much teaching and research are crippled by poor libraries... There is no

better way to judge the quality of an educational institution than to look at its library” (as cited in Chaturvedi, 1994).

Although ancient universities like Bologna, Paris Oxford and others around Europe were founded towards the end of the 12<sup>th</sup> century, and some more were founded by the end of 1500, the main university expansion took place in the 19<sup>th</sup> century. Many of these new higher education libraries had their origins not in the traditional type of universities but in more practical educational institutions. In early 1880s, when concerns were being expressed about lack of education for working people in industrial towns in the UK, a movement towards founding Mechanics’ institutions began. These institutions had the library as a basic element, but the role of some of those libraries declined with the existence and influence of the public libraries. Some of these public libraries, such as the Mitchell Library in Glasgow were founded with bequests from wealthy manufacturers in the area. Other Mechanics’ Institutes went on to become technical colleges and universities, with the library expanding alongside (Brophy, 2000a). The University of Manchester combines the Victoria University of Manchester and UMIST, and the latter can trace its origins to the Manchester Mechanics’ Institute founded in 1824.

When colleges and universities came into existence, they did have libraries but they were often small and they grew very slowly. For example, in 1424, Cambridge University library had only 122 volumes. The number increased later on by purchase, copying and most importantly, by gifts and donations. Scholars had to travel from one library to another for rare books and manuscripts, unlike today’s epoch in which books travel to users (Brophy, 2000a).

The pace of book production had a major impact on the development of university libraries. It is in the 16<sup>th</sup> century when a remarkable increase in book production occurred. Although more than one estimate exists in the literature, Johnson (1970) suggests that there were about 100,000 titles produced in the 16<sup>th</sup> century, and the number of copies of each title was increasing during the 17<sup>th</sup> and 18<sup>th</sup> centuries. In the 19<sup>th</sup> century, millions of copies were produced and numbers grew rapidly. However there was no

minimum standard for academic library provision in the UK until the middle of the 20<sup>th</sup> century (Brophy, 2000a). SCONUL was founded in 1950 (as the Standing Conference of National and University Libraries). In 1994 it merged with COPOL, the Council of Polytechnic Librarians, and many of the British polytechnics were reconstituted as universities around that time. In 2001 SCONUL changed its name to the Society of College, National and University Libraries, to include colleges of higher education (often teacher training colleges in origin) into membership. SCONUL collects statistics from academic libraries, as well as trying to share and develop good practice among its members. The topics and issues of particular concern are (currently) e-learning, e-research, human resources, information literacy, performance improvement, quality assurance, scholarly communications and space planning. Some of these issues will be discussed next in section 2.2.1 to support required change in academic libraries.

Prior to the introduction of digital collections, the collections in university libraries were increasing in size, especially to cope with the explosion in the number of journals, in pace with rapid changes in scientific knowledge. Rathe (2005) states that during this time of increased competition and budget constraints, libraries may not be able to provide a recreational reading collection for pleasure, a sign that academic libraries needed to focus on core purposes, alongside the changes in functions brought about by e-learning and changes in scholarly communications. The great increase in publications has definitely affected academic libraries and caused changes, as budget difficulties have required new solutions to be found.

### **2.2.1 Organisation and change: academic library response**

Academic libraries are exposed to both internal and external factors which cause organisational changes. Going back to 1940 until the early 1950s, libraries faced critical information problems. At that time there was the pressure from releasing huge volumes of enemy documents from wartime, which caused the traditional system of bibliographic control to fail (Rau, 2007).

Perhaps traditional collection management methodologies cannot respond to the 21<sup>st</sup> century development. Corrall (2012a) states that collection management covers all activities involved in managing access to information resources, and these have changed in response to digital technologies. Kulp and Rupp-Serrano (2005) think that library environment and United States Midwestern weather have something in common, the continuous change! Davies, Kirkpatrick and Oliver (1992) discuss how university libraries in the UK faced the problem of managing change during the 1980s, in particular the change from a traditional library (resources and collection led) to a library that follows a service-led strategy, where provision of services is given priority over resources collection. This change raised many issues and one major issue is the clash between the existing culture (the existing way of doing things) and the demands of a new service-led strategy.

From their work, they conclude that there are usually key areas in some organisations in which mismatches exist. These gaps often happen to be between the strategies stated and the actual way of doing things (culture or reality). If such areas were identified; then it would be easier to manage change as these areas may then be targeted for improvement. For example; Davies et al. (1992) found that the management strategy of 'operating the library as academic support service' was not clearly understood by many staff in the university library studied: it was even opposed by others. This suggests that serious attention should be given to such a strategy to improve its chance of successful implementation. Moreover, to understand and manage the change, it is important to examine how thinking and practice related to collection development (selection/de-selection of material) have changed in response to digital technologies (Corrall, 2012a).

According to Corrall (1995), the establishment of the Joint Funding Councils' Libraries Review Group in 1992 and the following publication of its report (the Follett report) in December 1993, was the most important development for libraries in higher education. This review was commissioned jointly by the Higher Education Funding Council for England (HEFCE), the Scottish Higher Education Funding Council, the Higher Education Funding Council for Wales and the Department of Education for Northern Ireland. The group was chaired

by Professor Sir Brian Follett and the members met several times between October 1992 and October 1993 (HEFCE, 1993a).

There were many reasons behind the establishment of the group, such as concerns regarding the increasing number of undergraduate students in the UK, and hence, increased pressure on library services. Another reason was the awareness of the need to consider library provision from both teaching and research perspectives. A review was needed in a time when developments were taking place in higher education which indeed affected academic libraries.

The Follett report stressed the need for changed attitudes, changes in the functions and the way of work among libraries and information services in university libraries: “Higher Education Institutions (HEIs) need to reassess the position of libraries and librarians and their functions, clarify their objectives, and resources to enable these to be met” (HEFCE, 1993a). The report also emphasizes the necessity to shift towards information and information access, and one set of recommendations of the report (paragraphs 357-361) concerned electronic documents, journals and books. Through the Joint Information Systems Committee of the funding councils there was a large investment over three years to support development projects around information technology use. The accompanying Fielden report on staff management was published separately, and there were working papers to accompany the Follett report itself (HEFCE, 1993b). Brindley (1994) presented an overview commentary on the Follett report, focusing on information technology; one of the three sub-committees that structured the review group, these were: funding and resources, the management of libraries and information technology. The information technology sub-committee tried to encourage higher education libraries to exploit new developments and raise the awareness of future options and cultural change. This paper was published again in 2006 as part of series of articles in commemoration of the 40<sup>th</sup> anniversary of the *Program* journal (Brindley, 2006).

There is much written on the need to change academic libraries. Some studies examine the external and internal factors that drive organisational



change, much of the literature stresses the need for cultural change, but there is little in-depth analytical research that investigates processes. A LISTA search for 2001-2011 (limited to peer reviewed articles) on academic libraries and change management, produces only two documents on workflow and processes. Jeal (2005) introduces plans for business process re-engineering at Salford University, by reviewing their library processes, empowering staff at the front-line and focusing on customers' needs. Boss and Schmidt (2007) introduce workflow ideas for the academic library, and they believe that for an effective library, the concept of process-orientation and the business model of change management must be applied. Examples of these models include total quality management (TQM), process re-engineering and learning organisations. The treatment of change in the literature is usually more general. For example, Atkinson (2003) used PEST analysis (which is a high level strategic analysis) to analyse various factors affecting the services. Identifying such factors should be able to deal effectively with change in strategic framework. PEST analysis helps illustrating the complex environment where academic libraries and information services reside and operate, by listing the Political, Economic, Social and Technological factors which affect the services provided. Atkinson (2003) also asserts the importance of library staff awareness to convey developments and adapt to changes as this plays a role in the effectiveness of managing change and embedding innovation.

There are many changes facing academic libraries that demand effective solutions. One of these is providing congenial space. Space is a major resource that has to be developed in any university library to cope with changes happening in higher education such as the increased use of group learning and the enhanced role of computers and technology in learning and research. The debate about library space started in individual university libraries, when they started fundamental evaluations of their space use (Houlihan, 2005).

A study at Loughborough University library was undertaken in 2006 through user surveys, to explore learner demands and expectations for space. The aim of the study was to find out how space is perceived by library users,

(Walton, 2006). The survey was targeted at both students and academic staff. The report discussed reasons for using the library, which were summarized according to responses in three themes: to access resources, to use learning space and to benefit from the environment. The report's author concluded that the library should maintain variation in space use to suit different types of learners.

Another space management issue that academic libraries are dealing with is the management of space allocated for print resources. As noted over ten years ago, many university libraries are (increasingly) incorporating digital material into their environment and budget (Martinez, Newsome and Sheble, 1998). As the amount of publications has increased exponentially, alongside digital dissemination, Juntunen, Ovaska, Saarti and Salmi (2005) stress the change in library environment, from physical library premises to virtual delivery of resources to user's desks and workrooms. Many university libraries are therefore moving towards a space-saving strategy, for example, the Cooper and Norris (2007) study focuses on developing criteria to determine the sustainability of e-journals at Imperial College London, since investments in e-journals duplicate print back-runs. They developed a tool-kit for print back-run deselection decisions, and were able to identify 700 meters of sustainable stock for disposal from one site.

E-learning, e-research and information literacy are "hot interest" topics that relate to this research, as they reflect libraries' response to changes facing academic libraries these days. As mentioned in section 2.2, SCONUL deals with a range of topics that identify issues for information services. The role of e-learning was recognized during 2003-2004 due to many factors such as:

- The work of some national developments such as the JISC funding for initiatives to support e-learning.
- The awareness and focus of libraries' and librarian's roles in supporting e-learning, through the publications of guides which encompassed upon such roles.
- The recognition of the positive impact of e-learning on libraries.

The SCONUL e-learning taskforce final report was issued in 2005. It focused on the evolution of learning and teaching by embracing many issues such as:

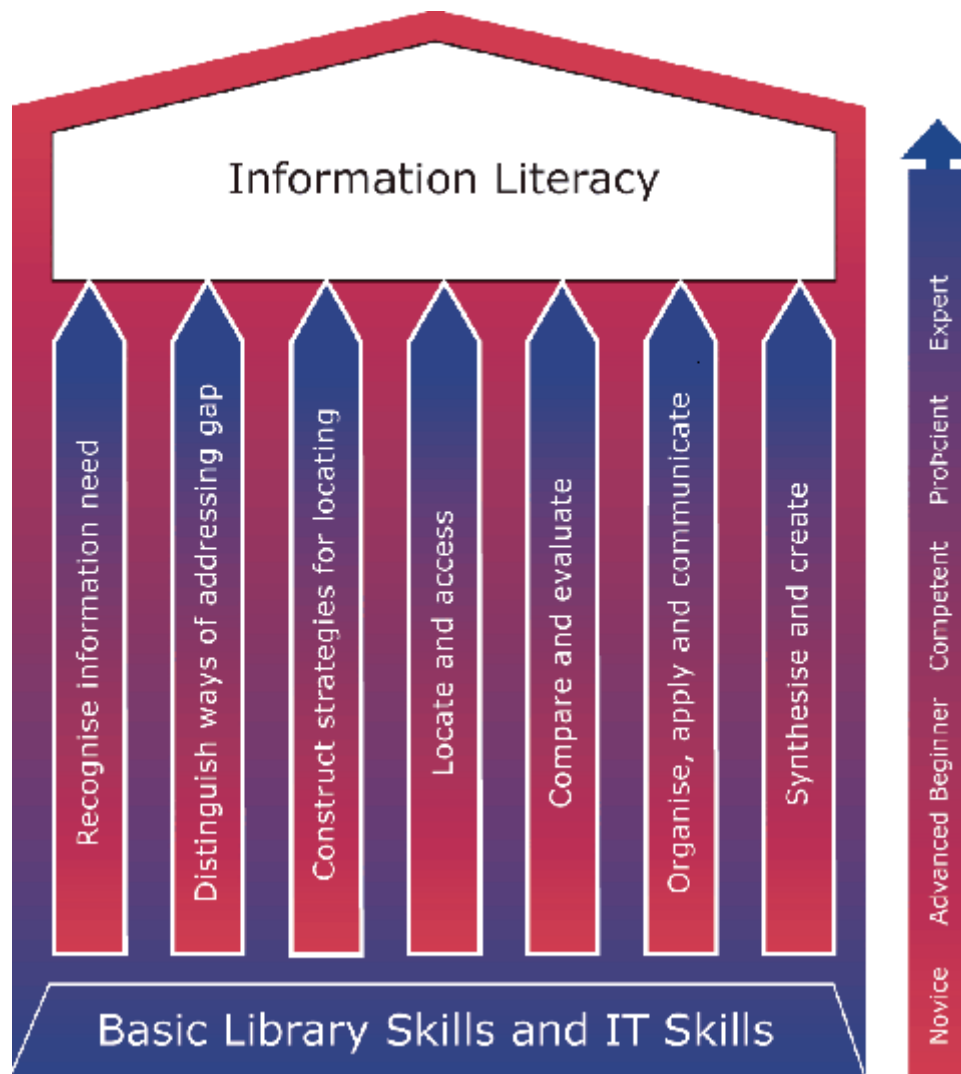
- adopting a definition for e-learning: “e-Learning is learning facilitated and supported through the use of information and communication technologies”
- seeking collaborative approaches in e-learning
- developing librarians’ skills, a priority for SCONUL advocacy

E-research is another important aspect that interests SCONUL. The CURL (Consortium of University Research Libraries) / SCONUL e-research joint group aims to engage libraries’ staff with their local e-research stakeholders. It is also responsible for monitoring and reporting on the group’s progress against the agreed action plan. The joint group raises the awareness and understanding of e-research issues in member libraries of both CURL and SCONUL. E-research is a major priority of the JISC agenda, encompassing research data management, digital repositories, and virtual research environments (JISC, 2011a).

Information literacy was the issue discussed in a briefing paper prepared by the SCONUL Advisory Committee on Information Literacy (1999). The paper suggests that the development of the information literate person is crucial, especially at that time, when a more explicit awareness of the size and scope of the libraries’ own approach to information handling skills has been growing;

*There is evidence of recent growth of activity in UK institutions in the area of information skills development... It is recommended that higher education in the UK should be more proactive in contributing to the debate about the learning implications of an ‘information society’. (SCONUL Advisory Committee on Information Literacy, 1999).*

To help achieve improvement in this matter, SCONUL proposed a model based on seven sets of skills (Boon, Johnston and Webber, 2007). These skills were developed from a basic competence in library and information technology skills. The model (showed below) was created to serve different levels of higher education work.



**Figure 2.1 “The Seven Pillars of Information Literacy model” (SCONUL, 2007)**

The national student satisfaction survey has been a big lever for change in universities and libraries in the UK. The survey started in 2005 and is still running across all publicly funded higher education institutions in England, Wales, Northern Ireland and some participating institutions in Scotland. The survey takes many aspects into consideration such as organisation and management, learning resources and overall satisfaction (The national student survey, 2011), but the questions about library and IT services are very superficial – “The library resources are good enough for my needs”; “I have been able to access general IT resources when I needed to”. These are, however, the questions that matter for many senior managers in the universities, as the answers to such questions may influence prospective

students in their choice of institution. However, the questions in the survey do not include any measure of satisfaction with other services that the library might provide to support use of resources, such as information literacy support, training in the use of specialised subject databases or software such as bibliographic software. There are more specific service excellence surveys such as LibQUAL+ that could help to identify best practice in libraries. LibQUAL+ measures library services across institutions and it has been used in various studies (e.g. Cook, Heath and Thompson, 2001; Cook, Thompson and Kyrillidou, 2010). According to Kyrillidou, Cook and Lincoln (2009), LibQUAL+ is a useful quality assessment tool for local planning and traditional library environment, but it is not appropriate for libraries with extensive digital resources. As a result, a protocol known as DigiQUAL® was developed in attempt to deliver a tool for measuring user perceptions of digital library service quality and defining its dimensions from the user's perspective.

There is the challenge of actually making changes after collecting the evidence. Although library surveys have made some progress in collecting evidence, regularly and consistently and incorporating data in decision making, problems remain if the library cannot effectively use the evidence to improve library services. According to the Hiller, Kyrillidou and Self (2008) case study that examined why evidence is not used widely in libraries, the participating libraries did not have the ability to identify research topics, develop and apply a research methodology and analyse results. The authors identified organisational factors for facilitating effective data use and informed decision making. These include: having a leadership that supports assessment; developing a customer-centred organisational culture; providing training in assessment techniques; and recognizing the value of using data in decision making.

In the UK, JISC has its own part in response to change. JISC has been supporting academic institutions in the UK by providing innovative programmes such as:

- The repository and preservation programme – which will be discussed in more detail in section 8.7.

- The resource discovery programme that supports seamless access to resources in a well-managed information environment to support the emerging developments (JISC, 2011c).
- The information environment programme which aims “to help provide convenient access to resources for research and learning through the use of resource discovery and resource management tools and the development of better services and practice” (JISC, 2011b).

In summary, the main recent concerns appear to be resource discovery and access, information literacy, new responsibilities in curation, and the maintenance of different types of learning spaces. The next section discusses the history of operations research in academic libraries.

### **2.2.2 Operations research, examining academic library operations**

Very little literature on academic library operations examines how and why certain functions and processes are conducted or how academic libraries are linked to essential roles and processes. This section tries to integrate the existing evidence (with a timeline provided at the end of the section). In a history of operations research in academic libraries, Rau (2007) argues that with the expansion of scientific research after 1945, research libraries started to drown in information which made skills and knowledge - developed by operations research practitioners - attractive to them. The need for more approaches to library operations started to emerge as well as the need for management and control of information.

Bensman (2005) refers to Donald Urquhart, the creator of National Lending Library for Science and Technology (now the British Library Document Supply Centre), who used probability techniques for managing the collections that served research libraries in both universities and industry. The main application was to serve the operating principle behind collection development for the above institution and its successor organisations.

Rau (2007) discusses some quantitative techniques that emerged between 1960 and 1970. These are: Poisson modelling to user activities, queuing theory to circulation and Markov chains to book availability. (As an aside, it should also be noted that there has been a recent shift of emphasis towards bibliometric studies, among the quantitative library science researchers, and the evaluation of research – as described, for example, in Vinkler (2010) – some university libraries may participate in such quantitative analyses). Rau (2007) suggests that operations research provided a basis for the large scale library computerisation projects of the 1980s and 1990s. However, most of the emphasis in the development of library management systems was on the development of information processing, developing cataloguing systems and co-operative approaches to automation. With the development of turnkey systems in the 1980s, less expertise was required by library staff (Tedd, 2007).

In the late 1970s a few approaches for examining library activities were developed. Lancaster and Cleverdon (1977) anticipated the growing emphasis on outcomes of library use and what users did with obtained information. In the 1990s, as previously mentioned, the Follett report discussed the response of academic library and information services to changes in the UK student population (Section 2.2.1). The Joint Information Systems Committee of the Funding Councils funded many electronic library initiatives under the e-Lib programme (Law, 1997). The changes occurring at that time caused many academic libraries to change their title to the “learning resource centre”. This indicates the change in its activities and functions.

With this revolution of electronic information, a step towards teaching and encouraging students to use newer electronic information services was needed (Hepworth, 2000). There was a shift in emphasis towards information literacy programmes (Owusu-Ansah, 2001) and their evaluation (e.g. for the UK, by Streatfield and Markless, 2008).

There has been an emphasis on outcomes rather than internal processes when it comes to measuring academic libraries performance. Library performance was frequently assessed in terms of quality expectations. The

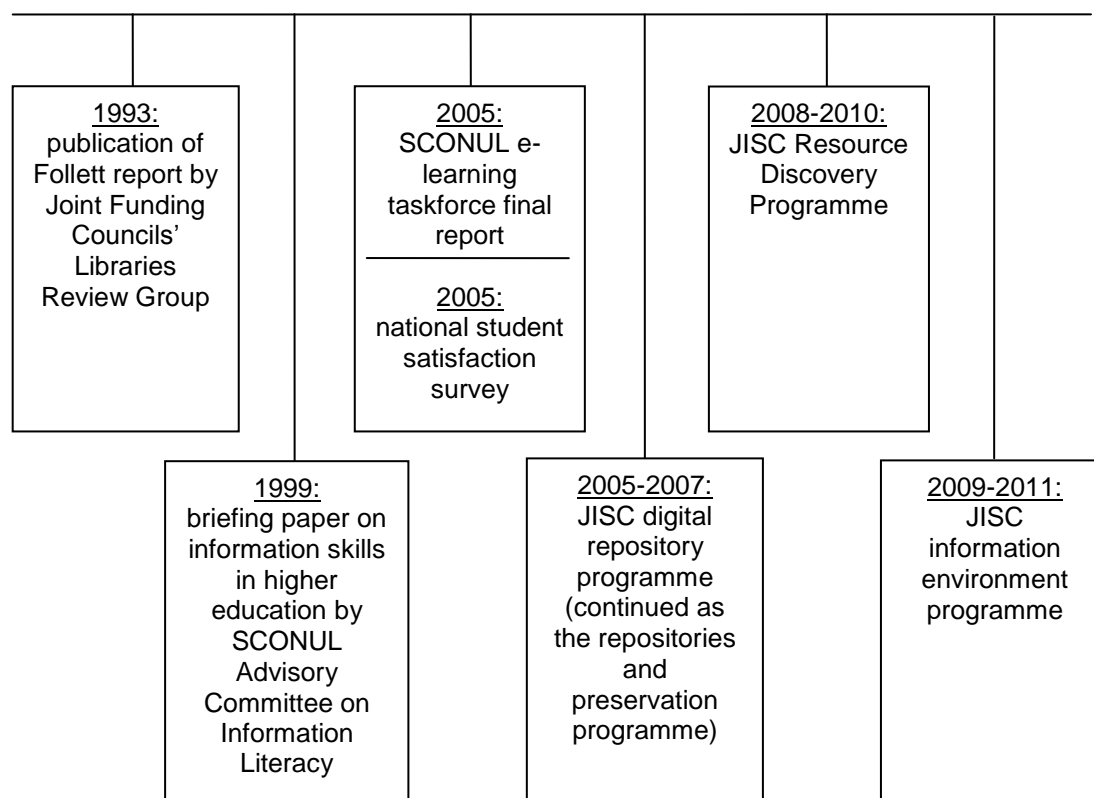
performance assessment framework that includes a criterion for internal processes has been used much less. A rare example, Kettunen (2007) uses the 'internal processes' to assess the effectiveness of co-operation activities in university library consortium in Finland.

Town (2004) suggests that measures in the process perspective area need to be based on a full understanding of the processes involved in delivering e-services. Section 2.3 discusses the application of Balanced Scorecard in academic libraries. Town (2004) argues that the processes of interest for a balanced scorecard measurement for internal processes for the academic electronic environment should include the project management perspective, for handling new services. Apart from this recommendation, nothing substantial has been published regarding this matter since then.

Process analysis is not very dominant in academic libraries. Most attention has been placed on analysis of e-resource usage. The analysis of electronic journal usage statistics, for example, can be time consuming and the task is more complex than it might appear (Conyers and Dalton, 2007). However, it is important to mention that although evidence (see also Section 2.2) shows that there is an apparent lack of interest in process analysis within academic libraries (Lakos, 2007), the absence of discussion of processes in academic libraries from the peer-reviewed journals and literature does not mean that there are no concerns or work done in that field, as there may be some internal unpublished reports e.g. Stanford University's approach to business process redesign (Stanford University, 2005). There are also the examples shown from data collected in this research (please refer to the last part of section 2.5 for detailed information). Unlike the earlier operations research, the more recent systematic approaches to examining library operations appear to explore the human roles and responsibilities in far more depth. Lewis (2001) examined the role of the electronic resource librarian and used some workflows to explain the suggested model for the academic libraries strategy suggested. Similarly, Ehrlich and Cash (1991) investigated the work of information intermediaries and how their support tools were used in their work.



Guise (2005) suggests a systematic approach that academic libraries can use to analyse their reference and instruction programming. Kennedy (2005) investigated how digitisation affected workload, staffing and outsourcing in resource preservation. In addition, McKiernan and Ohler (2006) discuss some of the changes to traditional technical services, and they refer to workflows but did not discuss or chart them. Similarly Schwartzkopf (2007) reports a presentation by Amanda Yesilbas on changes to the workflow for e-journal check-in, but no detail of the process is provided, only an outline. Capture of organisational learning and knowledge sharing requirements is proposed by Daneshgar and Parirokh (2007). In summary, the work may be carried out, but few in-depth examples reach the peer-reviewed literature and therefore learning from the experience of others is limited.



**Figure 2.2 Timeline of the main events in attempt to respond to changes in academic libraries**

## ***2.3 Quality and performance measurement tools in academic libraries***

Evaluation and management principles developed for the commercial sector are now perceived to be applicable to libraries. There is considerable work in the literature that uses the term quality around library and information services. This section provides an overview of some of the main UK and international initiatives and considers the scope of the performance improvement tools and techniques.

According to Brophy and Coulling (1996), quality is conformance to requirements, the customer's requirements. At that time, the British Library Research and Development Department was supporting research in quality management in libraries and information services, in attempt to apply quality management systematically in the sector.

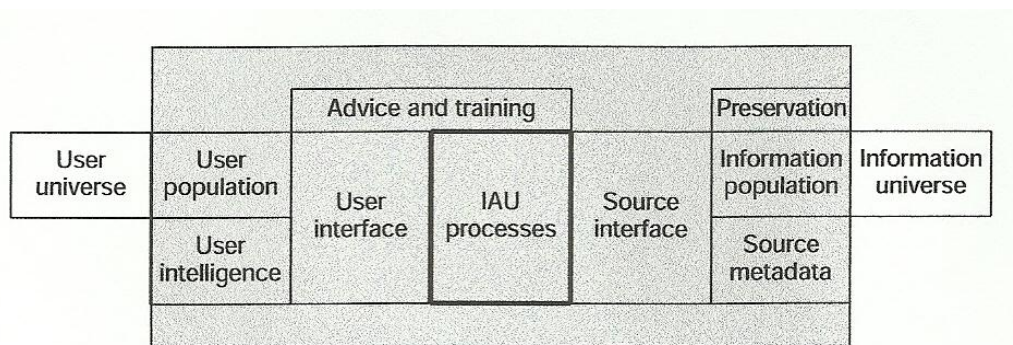
The importance of performance measurement has been recognised for a long time; "performance measurement in library and information services has since kept pace with the range of methodologies used in the profit, and not-for-profit sectors" (Cullen, 1998). Earlier studies carried out in the UK in the 1960s analysed academic library management decision making. Intense interest in performance measurement developed for several reasons; one was the increased pressure on resources, which demanded a higher level of efficiency of operations. Another reason was the demand for value for money and the adoption of "access" in preference to "holdings" (Brophy and Wynne, 1997).

As mentioned in section 2.2.1, the Follett report was issued in 1993 and it stressed the need for changed attitudes, changes in the functions and the ways of working among libraries and information services in university libraries. The report introduced a set of recommendations, one of which stated that a framework of coherent and generic performance indicators should be established to assess academic libraries. In response to that, the Joint Funding Council's Ad Hoc group issued a discussion document in 1995 arranging performance indicators into five areas, these are – as listed in Brophy and Wynne (1997) – the level of integration between the institution's

aims and those of the library's, user satisfaction, the level of delivery (how high the output is), efficiency (outputs in relation to resource input), and finally, cost per student. This was the first edition of the document, which was followed by a revised version in 1996 taking into consideration the readership feedback. Following this work, SCONUL suggested one more area of performance indicators to be included in the framework, networked services assessment. The British Library Research and Innovation Centre responded to this recommendation by funding research towards the preparation of suitable indicators in this area, a researcher was appointed to the post - based at Cranfield University - in 1997 (Barton and Blagden, 1998).

From the USA, the McClure and Lopata (1996) contribution to the literature of performance measurement addresses the whole academic networked environment which is directly relevant to electronic as opposed to traditional libraries. The report aimed to provide tools for library managers, to introduce techniques for assessing academic networked environment, and to urge academic libraries to regularly evaluate their computing networks as a means for improving academic networked services. The manual introduced six key assessment areas, these are: users of the network, cost of resources to operate the network, network traffic, amount of usage, services and type of assistance available on the network.

Brophy (2000b) introduced a generic model that identifies key processes which enable libraries to provide the added value to the users. The model is based on the concept of 'hybrid library'; exploring services in both electronic and print environments. The author believes that although the methods used to deliver the services in the digital library differ from those used in the traditional one, enabling users to access information they need sounds like a common mission, in which the issue of quality is important. Figure 2.3 below illustrates the model, which aims to understand the library's strategy, research and development. It has been developed to underpin some research projects such as: "the measurement of the performance of electronic and hybrid libraries" Brophy (2000b). The model appears robust and can be applied in both traditional and electronic networked environments.



**Figure 2.3 The generic library model (Brophy, 2000b)**

To understand the model above it is essential to learn about the concepts used. 'User universe' refers to the universe of selected users, for example, in a university; the users of its library could be the students and the academic staff. 'User population' however is a subset of user universe. On the other hand, 'information universe' refers to all sorts of resources that exist in the world, while 'information population' is symmetric with 'user population'. It is dynamic and has fuzzy boundaries. According to Brophy (2000b), one of the library's tasks is to make sense of 'information universe' for its users by selecting from it what is accessible and of interest. The term 'user intelligence' implies the necessity of having a detailed profile of all members of 'user population', for example; personal data and history of information access. Similarly, the term 'source metadata' ensures that 'information population' is reliable and adequately described.

After determining who to be served and what to be offered, the model introduces the 'user interface' and the 'source interface', where the first ensures provision of an interface to interact with the service whether it is a physical library or a webpage. The latter controls access to the information population. The term in the heart of the model refers to the functions needed to allow user interaction with the resources; these are 'information access and use' which includes search and retrieval of resources. Finally, the shaded area in the model indicates the processes that should be managed.

Moving to international quality assurance standards, ISO 9000 is one tool that can be used for quality management for service industries, including libraries and information services. According to Brophy and Coulling (1996), ISO 9000

is “a series of standards concerned with quality assurance”; it provides a way to meet the organisational objectives. It is criticised however for being expensive and bureaucratic.

The EQLIPSE (Evaluation and Quality in Library Performance: System for Europe) is a project that ran from February 1995 until March 1997 and aimed to produce an open software system containing quality management and performance measurement tools, based on ISO 9000 and the draft ISO 11620 standards. The project was funded as part of the European Commission's Libraries Programme. According to the MacDougall, O'Farrell and Williams report (1997), the objectives were:

*“The objective of the EQLIPSE project was to improve the effectiveness and efficiency of European libraries through the application of IT to quality management and performance measurement. Its overall objective was the production of a fully-tested functional specification for a software ‘toolbox’ product designed to meet this need in an open systems environment”.*

It was concluded that a prototype EQLIPSE system with a module for quality management and another for performance measurement is feasible and operationally successful. It can be integrated into library information technology system; “the prototype has been tested in two operational sites and experience of operability and validity obtained” (MacDougall, O'Farrell and Williams, 1997). Any library, however, that is not ISO compliant would find the quality workbench neither flexible nor easy to use.

In the Netherlands, the IWI consortium (which is translated as Innovation of Academic Information Services) started fourteen projects. One of them was targeted at the development of university libraries, and involved the performance of a quality audit. The project started in 1998 and was restricted to six university libraries. The method used was benchmarking (as a quality management instrument), while the instruments used included 24 performance indicators for the quantitative aspects and questionnaires for aspects that need opinions. It was concluded that benchmarking indisputably played a major role in improving the funding and the performance of Nijmegen University library, in which local implementation of the results was carried out for this work (Laeven and Smit, 2003).

Quite similar recent work related to quality measures and library processes was carried out in Finland in 2005. Quality has been defined in Kuopio University library in Finland as the service standard of the processes librarians carry out in order to ensure academic library services to their patrons. In an attempt to improve the library processes, Juntunen et al. (2005) used quality management as a tool for:

- leadership within the library
- marketing the library within the university
- improving the library processes.

To achieve improvements in library processes, they used user surveys and other information sources such as user statistics gathered from the library's own database and other databases. They also used auditing as part of the quality management process and this was found to be helpful, especially when librarians view it as quality assurance rather than inspection. The last part of their tool was supporting the digital environment including manuals, guidelines and documents for both library staff and users.

Coming back to the UK, it was mentioned in section 2.2.1 that LibQUAL+ is an example of a service excellence survey that could help to identify best practice in libraries. It is a useful quality assessment tool for local planning and traditional library environment (Kyrillidou, Cook and Lincoln, 2009). For digital library services however, DigiQUAL® is a better tool.

One of the themes of the work of SCONUL is quality assurance (mostly responding to government initiatives for improving and auditing standards of higher education) and another is performance improvement (mostly concerned with the collection of activity statistics, and development of performance indicators).

SCONUL faces a challenge with demonstrating performance improvement when dealing with higher education institutions:

*Not many parts of higher education can demonstrate such commitment as SCONUL to getting the facts and showing the trends in our annual*

*statistics, as well as in work related to e-measures and usage statistics (SCONUL, 2007).*

The Performance Measurement Action Team created by the Procurement Executives' Association in 1993 chose the Balanced Scorecard model – created by Harvard business professors Kaplan and Norton (Kaplan and Norton, 2001) – as a conceptual framework to translate the organisation's vision into a set of performance indicators distributed among four perspectives (Hopf, Litman, Pratsch, Ustad, Welch, Tychan, and Denett, 2004):

- Financial, which emphasizes cost efficiency.
- Customer, which reflects overall customer service and satisfaction.
- Internal business processes at which organisation must excel, they are the means to reach performance expectations.
- Learning and growth, this looks at issues such as information systems quality and employees' abilities.

The balanced scorecard seemed to be achieving impressive results. According to Norton and Strategic Enterprise Management (SEM) Product Management brochure (1999), the Balanced Scorecard is a performance management methodology that uses performance measurement information to assess current programs or policies, in order to meet organisational goals. Applying the Balanced Scorecard model in the case studies in their work showed that it can provide understanding, focus and alignment that unlock the strategic skills and knowledge of the organisation.

In academic libraries, there have been claims that the balanced scorecard provides the necessary balanced perspective on performance. "The balanced scorecard contains exclusive evaluations significant to strategy, integrated in a set of perspectives of equal value – users, finance, business processes, potentials – to produce a balanced overall assessment of the library". (Ceynowa, 2000)

Kyrillidou (2010) states that the Association of Research Libraries (ARL) invited interested libraries in 2009 to participate in a pilot project in attempt to develop library scorecards following the balanced scorecard approach to

develop metrics that are directly tied to the libraries' strategic goals. The collaborating institutions were: John Hopkins University, McMaster University, University of Virginia and University of Washington, with external consultant Ascendant Strategy Management Group. In spite of differences, in all individual libraries there seem to be key processes that are consistently important. According to Kyrillidou (2010) these are: setting strategic objectives directly tied to the organisation's mission; visualizing them into a strategy map; and communicating the map, the objectives and the metrics.

Cribb and Hogan (2003) discussed issues and strategies in implementing balanced scorecard in a small private university library to facilitate strategic planning and manage its performance. However, they state that there are some challenges associated with using this model, such as selecting appropriate performance measure for the four perspectives of the model (mentioned above previously). In addition, it is not always easy to collect the desired information and to systematize its production and analysis; "Alignment of libraries with the university's performance measurement methodology and identification of the library's contribution to the university's overall performance are not always straightforward." Cribb and Hogan (2003)

Although Calhoun (2004) believes that the balanced scorecard model provides a balanced view about the performance of an organisation, it critiques the considerable thought and time needed to develop a scorecard.

Although SCONUL have identified assessing value and impact of higher education libraries amongst their list of priorities in the 2005-2006 strategic plan (Payne and Conyers, 2005), there is still that list of themes that SCONUL uses – that is telling in a way – another government initiative, another theme, another response as another thing to do. There is less emphasis on really rethinking what the library does, and the only real glimmer is a very recent paper by Town (2011) on the transcendent value of the academic library. In his work, a new higher-ordered framework is suggested, based on a *values* scorecard for evaluation and performance measurement. Town (2011) believes that understanding the values is critical to effective future performance, and proof of value is not achieved by current measures since



these they are neither holistic nor placed on a high level. The concept that Town introduces is the transcendent library: “recognition of the full value of libraries in their contribution to more intangible wider benefits”. This seems to be meeting the stakeholders’ needs when talking about value and impact measures. Economic value tools do not offer transcendental solutions as they do not take into account intangible assets or wider concept of value. ‘Quality’ could refer to what a user say, but ‘value’ needs wider range of stakeholders. Town (2011) uses the concept of transcendent library to develop the assessment of value by defining, computing and presenting the values. The values scorecard suggested reflects the organisation’s view of itself as a creator of value, moving from traditional goals such as satisfaction and cost effectiveness, to more transcendent goals such as knowledge assets, research and innovation. As far as internal processes are concerned, these might follow once the transcendent goals were agreed, as the tactics to meet those strategic goals

Very little extensive evaluation of performance measurement methods is published in the peer reviewed literature. For example, Stephen Town is one of the key people involved in performance benchmarking in academic libraries, and use of the balanced scorecard in the UK, but over the past five years, much of his work has only appeared in conference proceedings (e.g. Town, 2011). The book on measuring library performance by Brophy (2006) provides some guidance on measurement methods, but it is notable that the chapter on processes (chapter 7) is comparatively short and there is no mention at all of workflow modelling. As far as the internal processes for the balanced scorecard are concerned, it seems that more emphasis has been placed on the financial, customer and learning/growth perspectives. This is understandable given the emphasis on cost restraints, the increases in the student population and the need to re-train library staff to work in the new information environments. There has been more interest in the business world on processes as the next section explains.

## **2.4 Business Process Modelling**

"Over the years, the scope of business processes and Business Process Models has broadened. Less than a decade ago, BPM, known then as "workflow," was a groupware technology that helped manage and drive largely human-based, paper-driven processes within a corporate department." (Havey, 2005)

Nowadays, business organisations are being described in terms of processes rather than functional hierarchies. Business processes refer to the workflow within an organisation or a company, the processes and the transactions involved within the enterprise. "When a business analyst stands sketching the flowchart of a business process as a cluster of boxes linked by arrows and asks the software team to make it run, Business Process Modelling comes to the rescue. BPM is a set of technologies and standards for the design, execution, administration, and monitoring of business processes" (Havey, 2005). In other words, business process models help in understanding the organisation's work, comprehending the processes in detail and then using technological support for the improvements to human activities.

Opdahl and Sindre (1995) argue that it is not only necessary to model the automatable information processing activities, but also material and human activities occurring around the computerised information system. Such human activities involve modelling of roles, actors, organisational units and the relationships between them all.

There is commonality between the above views and others (mentioned later) in that they all agree on the concept of business process modelling and its components. Processes comprise activities and interactions undertaken by people and machines to achieve the organisation's goals. The effectiveness of those processes and their interactions determine whether organisations can achieve their objectives, and how (Stevenson, 1993). As suggested by Green (2004), the requirements for a computer-based system can be derived when analysing those processes. The basic concepts in process modelling include: roles, activities, entities and interactions, where roles are composed of

activities that work on entities which communicate and collaborate through interactions (Ould, 1995).

Rosemann (2006) describes process modelling in an interesting way:

*Process modelling is an area where artists (heavy right brain utilization) meet scientists (heavy left brain utilization), internal knowledge workers meet external knowledge owners, business meets IT. It is not only about the final artefacts (the models), which represent the outcome of these modelling session, but it is the process of modelling itself and its impact on subsequent activities and projects, which deserves attention.*

As mentioned previously, business process modelling helps understand processes and supports process improvement. Cauvet and Guzelian (2008) suggest that business process modelling is used to automate business processes to increase productivity, and to evaluate, hence, improve existing processes. Although modelling processes using flow-charts has been part of software development since 1946, the current generation of analysts replaced this term (flow-charting) with process modelling (Rosemann, 2006). Business process re-engineering or improvement, however, is quite new, and there has been a change in terminology since the early 1990s. The original perspective on business processes was to use information technology to achieve efficiency, or to use methods to improve operative manufacturing processes (Tinnilä, 1995). Many articles have emerged in the literature since then, supporting the concept of process management and improvement using different terms such as: business process redesign, business restructuring and business process re-engineering (Zairi and Sinclair, 1995).

Much work has been done in business process modelling for various reasons. One crucial part of business process modelling is the representation and enacting of the processes. Research has been conducted in this area and it proved the importance of BPM. From the software engineering point of view for example, Curtis, Kellner and Over (1992) suggested that BPM provides a common representation of processes which facilitates groups' understanding. In addition, by analysing and supporting process behaviour; BPM can serve as a basis for process improvement, which is an important indication that supports this research.

Similarly, Huckvale and Ould (1994) suggested that BPM can provide a means for communicating, discussing and analysing existing processes, an avenue for designing new ones, a baseline for improvement and control. Both groups argued that having multiple objectives for using process modelling requires choosing a suitable method from different modelling methods, according to their properties and characteristics.

Another example is the application of business process modelling at Timberland Co., a case study outlined by Grosz (1998), which supports the idea of using process modelling for further process improvements. Grosz states that “process modelling was introduced to the Timberland Co. in order to help improve the company’s increasingly complex and cross-functional business processes.”

Lin, Yang and Pai (2002) discussed the importance of BPM by stressing two key points, and these are: 1) BPM helps capturing existing processes and representing new ones in order to evaluate their performance, and 2) BPM facilitates process evaluation and alternative selection. Again, this is very essential for this research as it looks at process improvement. Aguilar, Ruiz, García and Piattini (2006) believe that a suitable evaluation of business processes at the modelling stage makes maintenance easier and supports business process management.

As mentioned earlier, work was done by Danshgar and Parirokh (2007) on the awareness net model and the organisational learning requirements. This article argues that before learning happens, there is a need for identifying the knowledge sharing requirements of those actors involved in the process. Consequently, a justification for using business process modelling was introduced, which is providing a measurement for the awareness level of the actors within the process. As this model was constructed for information services activity; it would then help in deriving librarians’ requirements and keeping them aware of their learning contexts and processes.

All the examples show that business process modelling may be used as a tool of enquiry, with the aim of learning, process selection/control or process evaluation/improvement (or a mixture of these aims). As mentioned in section

1.2, the modelling tool used to represent processes in this research is RAD, and it is a role-based modelling technique. Before further discussion of the process modelling, the concept of role and its application in the literature needs to be considered.

### **2.4.1 Roles**

Roles have been applied in many fields such as sociology, management, psychology, library science and computer science. The consideration of the word 'role' across these disciplines poses some challenges in definition of terms, general understanding of problems and their description. Role concepts have been applied widely in management, sociology and psychology. Zhu and Zhou (2008) state: "Roles are very useful in modelling the authority, responsibility, functions and interactions associated with manager positions within organisations".

Historically, it was not until the decade of 1930's when the term 'role' was employed technically in writings on role problems. Many writers contributed to the concept of role theory in the period from 1931 till 1960, and they have used 'role' as an adjective to modify concepts such as performance and behaviour. Earlier thoughts about roles came from the organisation perspective. The role perspective was discussed by Biddle and Thomas (1966). They state that individuals in society occupy positions and that there are certain factors that determine their role performance. These are: social norms; the role performances of others in their respective positions; those who observe and react to the performance; and the individual's particular capabilities and personality. There are different approaches taken when it comes to role usage, however, and very few have built on the work of others, particularly those from other disciplines.

The term 'work role' is also cited in the literature. Huvila (2006) defines a work role as a set of activities within a work, a role acts as viewpoint situated within work, just like 'work' in a human life world, given the latter in a broader scope. According to Huvila (2008), an individual may perform more than one work

role and may share work roles with others, which means it is not exclusive. Nurminen and Torvinen (1996) states that using the concept of work role in some approaches to information systems development indicates that such approaches are seeking better understanding of work activities and moving towards specialization structures to develop a more robust and useful information system. The concepts of 'task' and 'work' have proved their values in information science research. The term 'work' started to attract attention after the rise of information seeking and information behaviour, when emphasis on users became more important (Huvila, 2008). In this article 'work' is considered an upper level activity that combines different work tasks (or activities) together, it is situated in broad cultural contexts and it can consist of overlapping processes.

There have been some remarks about using role theory in information behaviour research. Leckie and Pettigrew (1997) state that the role is a general concept and consequently, the theory is problematic in its broadness. Huvila (2008) however, argues that a task can be problematic in its precision as well, when tasks become isolated from each other, and more importantly, from the reasons that triggered the process from the first place.

Approaches based on the concept of 'role' are emerging in information system design and implementation. The concept of role has been cited occasionally in information systems literature, but not frequently in library science research. From a technical perspective, Ould (2005) indicates that a role is a responsibility, as it carries out actions that follow business rules

In computer science, and from the object-oriented point of view, Albano, Bergamini, Ghelli and Orsini (1993) implemented an object-oriented programming language Fibonacci with roles. Their role concept concentrates on the evolution of data objects. In this context, the roles are designed as classes, they express the different states of an object, and an object may change to express the different roles it plays.

Although objects play roles, in collaborative systems, human users play roles. The concept of role is a key concern in Computer Supported Cooperative Work (CSCW) systems. These are computer-based tools that support the

collaboration of human users' activities. Zhu and Zhou (2006) state that it is important to define the concept of role clearly before applying it in any CSCW system, since the roles played by participants in a collaborative activity are crucial to produce successful results. The authors define a 'role' in the context of collaboration by two aspects: rights and responsibilities, in that, roles specify what the system request and what users ask from the system, for example, for a person X to collaborate, they need to know what they can do and what they want to do, they also need to inform others of this and finally, must know the objects in the surrounding environment.

In attempt to discuss how the roles of health library and information professionals have developed, Brettle and Urquhart (2012, xv) identifies a role from a sociology perspective, in that: "a social role is defined by a set of expectations, rights, duties, norms that we expect people in those roles to have, and which govern how they should act". Therefore, work in organisations may be expected to take place when people working in specialist roles interact. Brettle and Urquhart (2012) referred to the problem of role conflict for an individual – having many roles competing for time and attention.

Other literature focuses on how roles operate and how they interoperate. Sarbin (1954) introduced the mechanics of role-taking process, these are: 1) the number of roles, where it is subject to observation and report; 2) organismic involvement, which means that there are various levels depending on how involved the role is and what the effort / effect is like, and 3) accessibility, which applies to events in which the actor in the role reports actions. Wahlke, Eulau, Buchanan and Ferguson (1962) used role structured networks to construct the legislative chambers of four states. The study suggests that when using non-traditional analytical categories derived from a role analysis of legislators, a structure of legislative chambers can be described as it represents a system of action. In 1992, Singh and Rein argued that role theory presents individuals as occupying positions in the organisation where roles are the building blocks of organisational structure (as cited in Shneiderman and Plaisant, 1994).

It was in 1993, when the role theory was accepted, that it was introduced into the Business Process Re-engineering (BPR) approach. BPR involved business processes, their relations, individual tasks, and it also presented actors (Hammer and Champy, 2003). Although conventional wisdom suggests that reengineering at that time was just a fad in the early 1990s, Hammer and Champy (2003) believe that real businesses have been using reengineering since then to transform segments of their operations. They refer to reengineering as the fundamental rethinking and the radical change applied to business processes to achieve improvements in various fields such as quality of services, and cost.

Analysing processes within knowledge intensive organisations inevitably requires an examination of the information systems used. Traditionally, information systems were constructed using relational databases (e.g. Oracle, Access) and the systems analysis involved for that uses methodologies such as SSADM (Structured Systems Analysis and Design Methodology). The emphasis there is on construction of a pure data view – the roles appear in the physical data flow diagram, and people may appear as external entities (data sources or data sinks). For pure database design, such analysis may be helpful, but for analysing processes, and examining who does what, such analysis often is inadequate.

Roles thus differ from entities used in database design. The entity/database type model was conceived in 1969 (Litwin, 1995). Entities are objects from the real world distinguished by other objects, and have sets of attributes. Entities have also relations with each other (Ramakrishnan and Gehrke, 2000). Guarino, Carrara and Giaretta (1994) distinguished roles from entities by proposing that: a) a role is a type that is founded; defined in terms of relationships with other things in a context, b) it lacks semantic rigidity. Caetano, Silva and Tribolet (2005) explains this by providing a book/reader example to understand the definition; where a concept of 'reader' is founded because there must be something to be read for a 'person' to be considered a 'reader'. A 'book' however is semantically rigid since its identity remains that of a 'book' regardless as to whether someone is reading it or not.



Information systems have often been designed around the information processing requirements, the entities of interest to the organisation, in other words, the database designer is often interested in the pure view of the organisation (Litwin, 1995). However, a process or a role carrying out a particular process might be of an equal or even greater interest, and some systems analysis approaches have experimented with roles.

For example, Object Requirements Capture Analysis (ORCA) approach does mention roles and covers behavioural modelling. MacLean et al. (1994) describe ORCA as: "ORCA's modelling languages provide the analyst with a way of looking at and talking about the world in terms of system components that respond to user-originated events". In object oriented analysis, roles are considered actors, "an actor is a role that a user plays with respect to the system" (Fowler, 2003).

In summary, role theory or the concept of role has been applied in different methods in information systems modelling. For BPR, the role is applied to visualize how people work together to achieve business objectives. Examples of two modelling techniques that use roles explicitly are Role Activity Diagrams (RADs) and Role Interaction Nets (RINs). RADs are to be discussed later in chapter five as they are the method used in this research. RINs, however, were developed by Baldev, Singh and others at MCC (Microelectronics and Computer Consortium) as cited in Harris (2000). The roles in RINs are carried out by individuals but the analysis includes automatic operation of computers.

#### **2.4.2 Librarians' roles**

Understanding both processes and roles in an organisation is crucial, especially now when organisations are becoming more complex with potent interdependencies between members (Kahn, Wolfe, Quinn, Sonek and Rosenthal, 1964). Avoiding what is called 'role conflict' is not less important. Gross, McEachern and Mason (1958) refers to role conflict as a situation where an individual finds himself exposed to conflicting expectations, some

people expecting him to behave in one way, some in another. In their study they present a theory of role conflict resolution for school superintendents, describing their behaviour after perceiving exposure to conflicting expectations.

Roles in academic libraries have changed, and they must be well defined and understood. Libraries have changed from simply being repositories of books, and similarly the responsibilities associated with library work have changed. However, although the role of “the librarian” has changed, professional role boundaries are less clear (Wilson and Halpin, 2006). This is accentuated by changes in organisational models and cultures of working (Reid and Foster, 2000) in academic libraries – with convergence of Information Technology / information services and library services, either directly or indirectly.

Indicative of the extent of this change is that it was in 1923 when the University of Madras in India created the post of University Librarian for the first time, the work was considered mundane since there was not much effort to be made (Ranganathan, 1963). However, with the explosion of knowledge in the late twentieth century, things have changed. For academic libraries, the changes in the research environment (e.g. more cross institutional collaborations) and educational requirements (e.g. more e-learning) have strengthened the need for better qualified library staff, and enhanced responsibilities for librarians and other information professionals employed in academic libraries. “Librarians may increasingly have to respond not only to increasingly interdisciplinary research agendas but also to different patterns of scholarly communication”. (Gannon-Leary, Bent and Webb, 2007)

University libraries have played a central role as custodians of knowledge and information, by adding value through identification, organisation, description and provision of systems for accessing resources for scholars to explore (Hayes and Kent, 2010). Librarians have an important role to play in achieving this. Generally, the role of the human being is essential in any organisation: “Lessons learned from the world’s greatest organisations show that even simple technologies can generate great performance when empowered by smart minds of motivated and committed humans” (Malhotra, 2005).

Librarians are expanding their interests and developing new responsibilities, therefore, flexibility and new roles for librarians are expected to emerge to enable them to cope with rapid changes and competitive environments. Some of the points listed in the Learning Resources Centre agenda at the University of Glamorgan for managing change in the early 1990s support the above statement. The agenda cites a demand for new staff structure that enables time and expertise to be devoted to strategic and operational planning. There is also the associated development of new job descriptions and specifications for all posts with a great emphasis on flexibility (Atkinson, 2003).

Bryan (1976) tracked changes in librarian's functions, noting that at the beginning, the main role revolved around guarding the treasures accumulated and used by others. The librarian's skills then developed to include organizing the books, and that is when the librarian became a cataloguer. In a later stage, librarians started getting involved in creating inventories for objects in a museum and acquiring more of them. In other words, it became the librarian's responsibility to acquire, arrange and provide access to books, also, to assist readers with their search. Bryan (1976) mentioned some possible reasons for the enlargement of the librarian's functions and he claims that this change came with the multiplication of libraries. On one hand, realization and awareness of the importance of information created a more dynamic role for the library, on the other hand, the users' needs and their lack of knowledge about the library content empowered the librarian's self-confidence and sense of mission.

In 1988, reiterating the evolving role of academic librarians, the Canadian Association of College and University Libraries (CACUL) released a statement that defines the university librarian's role independent of faculty status. Veaner (1990, p. 64) emphasised in that statement the part which says:

*College and university librarians play an integral role in the educational process of their institutions by their contributions to the pursuit, dissemination and structuring of knowledge and understanding....Librarians' responsibilities are diverse and may include development and evaluation of library resources collections.*

As has been mentioned in section 2.2.1, academic libraries are being exposed to external and internal changes. There is also the change in the nature of work, which is reflected in the expectations for librarians. Lynch and Smith (2001) conducted content analysis of advertisement for jobs in some academic libraries in the United States over a twenty five year period. The study revealed some changes in the nature of work, examples of such changes are: the inclusion of 'instruction' in the reference librarian job in the 1990s, and the emergence of combination jobs (which might also be due to budget concerns).

Another study by Wilder (2000) reports a decline of 63% in cataloguers' positions between 1990 and 1998, and an increase of 72% in functional specialist positions, those defined as experts in management fields and preservation.

According to Pinfield (2001), there has been a change in the role of subject librarians in the UK, the change embraces adding new roles to the traditional ones. More emphasis on liaison with users, involvement in the learning environment, selection of e-resources, working with technical staff and advocacy of the collections are all examples of new roles for subject librarians. Parsons (2010) states that it is important to develop practices undertaken by academic liaison librarians, who need to pay very careful attention to what is happening in their institutions to maintain and develop their role. However, there are difficulties associated with implementing changes in roles to meet changes in the business. Parsons (2010) states that academic liaison librarians are part of a larger organisational context, and developing their role is not simple: "their proposals will be met with resistance, some on the basis of sound reasoning, some on the basis of vested interests, some on the basis of (explicit or implicit) ideological stances".

In attempt to develop academic liaison librarian role into what they seek to become, Parsons (2010) suggests more engagement with the educational institutions within which they work, including involvement in educational practices of learning, teaching and research on the one hand, and engaging with the broader organisational practices and goals of the university on the

other hand, since universities have different views of themselves. Universities may see themselves primarily as businesses to grant degrees, or they may see themselves as providing the means of growing the economy and better social welfare, or they may see themselves as a place where knowledge and the exchange of knowledge should take place for moral reasons.

Corrall and Keates (2011) investigated the involvement of subject librarians in Virtual Learning Environments (VLEs). The survey of seven UK universities found that the involvement of subject librarians in VLEs varies between and within institutions due to many factors such as the subject area, the technical set-up of the VLE, academic staff cooperation and librarians' response to technology-based teaching. The authors of the study state: "recognition by academic staff of the teaching role of subject librarians has a critical impact on their involvement with VLEs".

Although much attention has been given to stressing the importance of librarians' role in academic libraries, some studies show that not much has been done to change the way librarians think or even make them rethink what the library - as an organisation - is really about, the different processes in the libraries and ways of working. Murtagh and Williams (2003) wondered if the following statement by Payne (1996) still holds true: "Most businesses would go bankrupt if they ignored their customers to the extent most academic libraries do. Our clients and their needs are the only rationale for our existence". Murtagh and Williams (2003) stress the importance and effectiveness of librarians' role in academic libraries to develop education: "just as bricks alone do not make houses, information alone does not make education". In their case study they hoped to move towards seeing the world from the eyes of library users.

An associated example of more recent work is a study in 2007 by Daneshgar and Parirokh on the Information Services Activity (ISA) process in academic libraries, which suggested a model to capture the organisation's learning requirements. The ISA includes reference, instructional and consultancy services within the library. The model suggested is called Awareness Net, which is a conceptual model or an analytical tool that consists of collaborative

semantic concepts linked together in a graph, in which a shadowed circle represents a role, and a plain circle represents a task. If collaboration exists between the two, then a thick line links them, in this case, it is stated that this role uses knowledge to execute that task.

The authors of the awareness net model suggest that such a framework will enable librarians to identify knowledge-sharing and collaboration requirements, and it will also facilitate the learning among librarians by answering important questions such as: 'what to learn?', 'For what purpose?', 'From whom?' (Danshgar and Parirokh, 2007). Interestingly, perhaps, this paper has not been cited by other authors yet, according to a search done on ISI (Institute for Scientific Information) and Google Scholar (date of search early 2012). It is very difficult to offer any authoritative critique of such models with little interest to date in the library literature.

### **2.4.3 Pitfalls for BPM**

Business process modelling is used as a means to visualize business processes. According to Rosemann (2006), nobody questions the importance of business process modelling, but the important question is: how much modelling is needed? A similar conclusion was drawn by Kueng and Kawalek (1997): the question is not whether process modelling is used but how it is used, whether process models are a help or a burden.

Rosemann (2006) summarized some pitfalls associated with the use of business process modelling, and these are some of the points raised:

- (1) Lack of synergies, where in many organisations different groups model the same process independently for different purposes, which makes reuse of the model not fully utilized.
- (2) The availability of qualified modellers with the right methods and skills.
- (3) The right mix of business representatives who are experts in the current processes, who provide directions and create ideas. This is not

really a big issue in academia but certainly a problem in the world of business.

- (4) The chicken and egg problem is one related to tools and requirements where the chicken is the modelling tool and the egg is the language used. Some organisations might want to model a process in a specific way but there is no tool that can support the suggested model. Moreover, there is the problem of selecting the modelling tools, as some organisations tend to select them based on recommendations of market studies.
- (5) Lack of details, as there are some modelling languages that have limited capabilities.
- (6) The complete translation from business models to system models is still limited.
- (7) A common trap when it comes to modelling is going deeply in the process trying to capture all scenarios, however, overly detailed models take longer to design, review and maintain. It is essential to keep the balance when it comes to the level of detail.
- (8) Lack of measuring modelling performance. It is important to understand the parameters we are seeking to change and to be able to improve the process.

As seen from the above, there are some problems related to the use of business process modelling, as it is important to understand processes, to support business process innovation (thinking outside the box) and to manage the level of detail in the process. It is also essential to select the appropriate modelling method and tool based on certain frameworks for selecting business process models.

## **2.5 *Modelling methods***

There are various methods for modelling business processes. Each method employs a set of notations that represent business processes from different

perspectives. Rosemann (2006) argues that process mapping and flowcharting have been around to visualise a business process for a long time. For example, one of these flow charts is the one developed by Goldstine and Neumann in 1946 (as cited in Rosemann, 2006). As mentioned earlier, analysts nowadays prefer the term process modelling rather than mapping or flowcharting.

Simple flow charts are still used, and an example from the library literature is the flowchart used for representing the process of downloading an article (Cyburt et al., 2010). Data flow diagrams (DFD) are another example of a modelling method. DFD is a process technique which is fundamental to structured systems methodologies. It provides the analyst with a specification of the system at the logical level, in other words, it describes what the system needs to do rather than how things are done. The symbols might differ from one DFD to another according to the various proponents of structured systems but the concepts are the same. The method was developed in late 1970s (Avison and Fitzgerald, 2006). Although DFD is an essential technique for information systems development, it has limitations when it comes to addressing information about processes. Important details are missing such as the duration of time needed to transfer data from one process to another and the details of data passing between processes. Moreover, DFDs aim to provide a logical representation of the system in terms of logical processes rather than physical one (Avison and Fitzgerald, 2006). The physical representation is only the first step in the derivation of the logical data flow model.

Caetano, Zacarias, Silva and Tribolet (2005) stated that the Object Management Group summarized the basics of process diagrams in its Unified Modelling Language (UML). Similarly the Business Process Management Initiative (BPMI) working group released Business Process Modeling Notation (BPMN) that is designed for describing processes in business process diagrams. In addition, there is the Integration DEFinition (IDEF) family which covers a large area from function modelling to information, knowledge acquisition, simulation, object-oriented analysis and design. Waring and Wainwright (2002) investigated and modelled processes in a UK hospital trust



in NE England using the IDEF0 software tool. Noran (2000) presented a comparative study of UML and IDEF as process models and provided similarities and connections. The study concluded that choosing the right method depends on the user, tasks, background, patterns and resources available, as IDEF comes from information environment and aims to cover knowledge representation, but UML, however, comes from object oriented domain (with more emphasis on computer science needs).

Ould (1995, for example), developed the STRIM method (Systematic Technique for Role and Interaction Modelling) for business process design in his book *"Business Processes"*, and this method predates his later development of Riva, which includes methods for designing process architecture. More details about Riva as a method will be provided in section 2.5.1 as it is the method selected for this research. Presley and Liles (2001) proposed IDEF5 as a modelling methodology to design enterprises, and the method supports a process-centred approach. Although the proposed method presents multiple views of an enterprise, it has its limitations as it is largely conceptual. Further testing of the approach is needed, and the technique is manual, not yet automated.

Odeh, Beeson, Green and Sa (2003) demonstrated the differences and similarities between Role Activity Diagrams and Unified Modelling Language, and the paper showed that it is possible to translate from RAD to UML but still, it will rely on the translator's ability to maintain the equivalence between the two.

Avison and Fitzgerald (2006) mentioned other process techniques, and these are mentioned below briefly:

- (1) Decision trees: which is a good method to be used when it is needed to illustrate actions that might be taken after a specific decision, however; they might become complex when the number of nodes increases.

- (2) Decision tables: which provides a solution when the number of actions is large, as they can be decomposed, however; they provide no sequence of actions to be followed.
- (3) Action diagrams: “bracket notation is used to indicate specific instances of selection, repetition, and simple sequential operations” (Wieggers, 1988). According to Avison and Fitzgerald (2006), some people criticize action diagrams for their lack of graphics as they employ brackets, but they are easy to use and utilize.
- (4) Petri nets do allow representation of synchronisation of operations – what needs to happen to trigger an operation.

As far as the published literature concerned, very little work has been done to explore **library processes** through modelling. Liu, Alderson and Qureshi (1999) presented a paper in which they studied legacy system behaviour. The case study chosen was Staffordshire University library. They used various software engineering and semiotic techniques, including RAD which was used to model the process of checking out a book in the library. Modelling that process was part of understanding the system’s requirements which could therefore be used to enhance the legacy system or integrate it with other parts of the information system.

In another paper, Khan, Odeh and McClatchey (2006) investigated the process of a scientific publishing process for digital libraries. The process was modelled using RAD. The aim of their research is to bridge the gap between business process modelling and grid computing, as business process modelling languages such as RAD have limited applicability in terms of enactment over distributed systems although providing great flexibility for modelling business behaviour.

Apart from these, little work appears to have been done and published on modelling library processes. The above two studies introduced RAD as a modelling tool to represent some library-related processes. Other more general modelling methods have been used within academic libraries to model and improve processes. McKnight and Austin (2008) used the Customer Value Discovery (CVD) model at Nottingham Trent University’s

library. This model has been used in Australia since 1994 and in the United Kingdom since 2002. The model has been constantly refined since it was released to maximise its efficiency. It is used to discover all success factors through group feedback in a meeting. In 2003, McKnight and Livingston applied the model to the learning services at Deakin University, which is the major academic support unit for the university. The whole aim is to improve students' learning outcomes. The first step of applying this methodology is to conduct customer discovery workshops to let stakeholders identify what products and services they value, what irritates them and what the levels of irritation are. The second step is using the software iThink to undertake modelling to show the changes in overall customer satisfaction as irritants are adjusted. This method is helpful for predicting the effect of changes and to assist library staff in making better decisions.

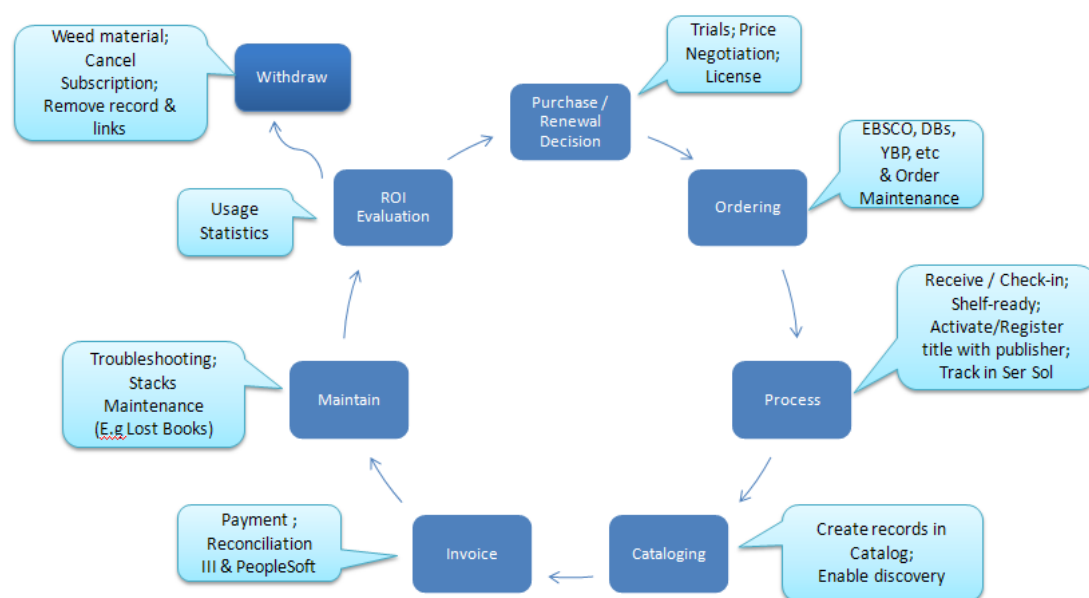
The above CVD model is based on the hierarchy of value which provides evidence on which services are most important, thus, enabling concentration on those services. The model was also used in a study focusing on internal business processes in two university libraries in the areas of acquisitions and cataloguing. That study showed improvements in overall customer satisfaction rating (McKnight, 2007). Although the CVD methodology is robust and was applied successfully in the mentioned case studies above, limited library budgets may not help facilitators to undertake the research (McKnight and Berrington, 2008).

Dougherty (2008) suggests some tools for process analysis, examples of such tools are the workflow diagram and flow chart. He examined the layout of an interlibrary borrowing unit using a work flow diagram, and presented an overview of searching an interlibrary borrowing request through flow charting. The author argues that flow charts can be used in libraries to analyse processes and procedures that involve many decision points.

Pan, Somerville, Howard and Mirijamdotter (2008) presented a case study of Auraria library – a North American academic institution – which planned and implemented change within an evidence-based leadership culture. The full paper for this work was introduced by Pan and Howard (2009). They believe

that libraries must develop viable workflow efficiencies where processes are clearly defined, to be able to respond to new demands. The learning resource lifecycle (with processes indicated, see Figure 2.4) served as a framework of understanding for redesigning the workflow processes. According to the authors, the model provides a solution to challenges associated with establishing efficient workflow for electronic resources management with challenges such as lack of solutions in the literature and ineffective hierarchies and processes for local and current requirements. For redesigning the work flow processes in technical services, four factors were considered for redefining roles: library needs, department needs, personal interests, and individual capabilities.

The learning resource lifecycle model starts from ordering material and goes through various phases, or main business processes. Use of the model helped in “appreciative enquiry” with the staff to discuss roles and responsibilities, and in some cases, to ease transfer to other departments or shifts in responsibilities.



**Figure 2.4 Learning resources lifecycle (Pan et al., 2008)**

Some work may be kept in the internal records of some organisation. For example, it was found from the data collected from the two UK cases in the research that workflow diagrams of some sort were used to model processes such as digitization and book ordering: This suggests that although these documents are not published externally, some libraries have thought of modelling to represent and document some of their processes (See Appendix 3).

### **2.5.1 Selecting a modelling method**

Although many methods for business process modelling emerged in the literature; there are relatively few studies that have examined what tools or methods are best suited to analyse business processes. Most articles proclaim the virtues of a particular technique (usually devised by the author of the article). A particular method may limit the way in which different processes can be characterized. This reason was the main motive behind both the work of Curtis et al. (1992) and Luo and Tung (1999).

Curtis et al. (1992) proposed four perspectives in modelling business processes:

‘functional’ perspective; where the process elements to be performed are identified,

‘behavioural’ perspective; which presents a model that specifies when process elements are allocated and how related actions are performed,

‘organisational’ perspective; which determines who performs process elements and where, and finally

‘informational’ perspective; which presents what informational entities are produced by a process such as data, documents, etc...

A later related study by Luo and Tung (1999) produced a framework for selecting business process modelling methods based on modelling objectives.

This work is interesting as it starts with setting the objective behind process modelling which then leads to determining the perspectives from which those processes can be viewed.

The objectives in this study were classified into three categories. When process modelling aims to simplify, clear and facilitate business processes by agreeing on a common representation among people in an organisation, then the objective is 'communication'. However, when analysts attempt to model processes for analysis and improvement purposes then the objective is 'analysis'. Finally, when there is a need for managing and monitoring processes, then the objective could be 'control'.

After determining the objective, it is now time to view business processes from certain angles. The classification of Luo and Tung (1999) of perspectives is quite similar to the one proposed by Curtis et al. (1992) which was mentioned earlier. Luo and Tung (1999) suggested three perspectives: 'object', 'activity' and 'role' perspectives. The first one is similar to the functional and informational perspectives mentioned by Curtis et al. (1992), as the activity perspective is essentially the same as the behavioural one, and finally, the role perspective represents a business process in terms of roles and their relationships, which is similar to the organisational perspective. The table below summarizes the two frameworks, and the arrows show the relationship between the perspectives suggested by both studies:

Curtis et al. (1992) framework	Luo & Tung (1999) framework
	<p>Step one: determine the objective behind the process model, these are:</p> <ul style="list-style-type: none"> <li>- Communication</li> <li>- Analysis</li> <li>- Control</li> </ul> <p>Step two: perspective classification:</p>
Functional perspective	Object perspective
Informational perspective	Object perspective
Organisational perspective	Role perspective
Behavioural perspective	Activity perspective

**Table 2.1 Comparison of two frameworks for modelling business processes to select a suitable modelling method. The arrows indicate similarities**

In a different work done by Lin et al. (2002), ten business process modelling methods were compared in terms of their components, representation, main features and modelling procedure, and Role Activity Diagrams is one of the methods mentioned. Their work introduced a generic structure for business process modelling in order to capture essential concepts of processes and represent them structurally. After analysing various business process methods; two more perspectives were added (to those provided by Curtis et al.) that of: verification / validation, and modelling procedures. These perspectives helped the authors in viewing business processes.

A similar study that investigated possible modelling methods was introduced by Bider (2005). He suggested four categories of approaches according to business process dynamics, which he referred to as the way of presenting the development of a process instance in time. One of these categories is the agent-role view, which illustrates the agents participating in the process and

the order in which they perform the work. Role Activity Diagram (RAD) is a typical example of the agent-role view.

Another work was added to the field of evaluating business process modelling languages, when List and Korherr (2006) proposed a general framework to capture a wide range of process concepts and to compare seven business process modelling languages based on a meta-model. The seven business process modelling languages compared are: activity diagrams, business process definition meta-model, business process modelling notation, event driven process chain, integrated DEFinition method 3, Petri nets and role activity diagrams. As the work of List and Korherr is based on the Curtis et al. (1992) work mentioned previously, the suggested framework consists of the four perspectives: organisational, functional, behavioral and informational, with an added one called business process context perspective, which reflects major business process characteristics such as goals and their measures. The following table shows the similarities and differences between the views explained above. Note that RAD is mentioned in each one of them:



Author(s) of study	Comparison overview
Lin et al. (2002)	<p>Compared 10 business process methods, RAD was one of them.</p> <p>Two perspectives were added to those suggested by Curtis et al. (1992), these are: verification and validation.</p>
Bider (2005)	<p>Four categories of approaches according to business process dynamics were identified, one of them is called: agent-role view. RAD is an example that represents this view.</p>
List & Koherr (2006)	<p>Seven business process modelling languages were compared, RAD was one of them.</p> <p>One perspective was added to those proposed by Curtis et al. (1992), these are: business process context.</p>

**Table 2.2 Different studies that introduced and compared business process modelling methods**

When viewing business processes from an organisational perspective, it is the “role” that is the focus. Although the term ‘role’ existed in social science theory in the 1920s, it is in 1970 when sociological role theorists defined a role as a person’s behavioural repertoire characteristic (Caetano, Silva and Tribolet, 2005). This led to some of the descriptions of role as outlined in section 2.4.1. In the 1950s, there was a diversity of role definitions, the most common definition is that “the role is a set of prescriptions defining what the behaviour of a position member should be” (Biddle and Thomas, 1966). However, a role in computer science is a modelling technique, as it is used to specify the responsibilities of a business object. In other words, a business object plays

roles in a business process when participating in different activities (Caetano, Silva and Tribolet, 2005).

When discussing processes, whatever the field is, a language is needed to define, record and talk about those processes. Riva is one example of analysis method based on the concept of “role”. Ould created and adopted the development of Riva method in the business process modelling field. Ould (2005) defines Riva as “a method for the elicitation, modelling, analysis and design of organisational processes”. Riva uses two languages to represent and discuss processes: the Process Architecture Diagram (PAD) and the role Activity Diagram (RAD).

PAD refers to the overall chunking of all organisation’s activities into processes, and it provides a complete comprehensive image of processes. RAD is a technique for process modelling which embraces roles as main component. It shows roles, their activities and interactions. Ould (1995) defines a role and activities as follows: “A role is a set of activities which, taken together, carry out a particular responsibility or set of responsibilities”. “Activities are what actors do as ‘individuals’ in their roles”. A role can take many forms such as: functional position or post like administrator, functional group like a library IT team, a class of person like a customer, and an abstraction like progress tracking. The two parts of Riva shall be explained in more detail in chapter five.

It is important to separate between two concepts in Riva: the role and the actor, where as the single instance of a role could be acted by different people at different times during the life-cycle of the process. For example; if there is a role called ‘project manager’, an instance of this role could be ‘manager of London office’ or ‘manager of Manchester office’, however, these instances exist independently of who is acting them; the instance of London office could be acted by John and then at a later stage by Paul. Moreover one actor can act a number of instances concurrently (Ould, 1995).

### **2.5.2 Use of RADs in this research**

As mentioned earlier, Ould introduced a method called STRIM, which he then developed into Riva, Ould argues that STRIM can be applied to explore opportunities for radical improvements of a process. Ould (1995) introduced the notations of RAD and how it can be used to model different everyday processes. He also concentrated on how to use model's features in order to further understand or improve or re-engineer a process, or maybe, an organisation.

As discussed in section 2.5.1, RAD was included in different comparisons and evaluations that provided a generic framework for selecting a business process method, as in the Lin et al. study (2002) for example. As RADs can be used to explore features that will enable further improvement of the current process, it seemed appropriate to apply this method in this research on academic libraries in order to try to make librarians reflect on their function. Setting 'analysis' as an objective leads to choosing the 'role perspective' for viewing processes. Consequently, using RADs is indicated as RADs are a very good, recommended example of a process modelling method from a role perspective, as the following examples illustrate

In 1998, Dawkins applied RAD for safety process definition. In his work he set concepts and principles to be considered when choosing a modelling method. These include the following: simple structure, starting with mature and simple concepts people can understand; using roles and paying attention that a role is not necessarily an individual but can be a class of people who carry out activities; cooperation between roles; and finally, tracking ability, which allows assessing the impact of any change by comparing with a previous model. Dawkins chose RAD as a modelling technique as it follows the above concepts and principles.

Rojas and Martínez (1998) used RAD to capture the main features of a two-role process of producing a document, when using RAD was a starting guide for a simulation model construction. Luo and Tung (1999) provided an example of an expense claim process to evaluate two possible modelling methods, RAD and DFD. In this example, the objective is to help employees

understand their roles in the process, that is why this process was modelled from a role perspective using RAD. Moreover, the notations used in RAD are less formal and rigid than the ones used in DFD, thus leading to the preferred use of RAD over DFD in this case.

There are several other published examples of RAD use. For example, Beeson, Green, Sa and Sully (2002) investigated the process linking strategic decision making with information system provision in an insurance company using Role Activity Diagram (RAD) methods.

Odeh et al. (2003) used the RAD to demonstrate the process of selection, enrolment and registration for research students at University of the West of England. They also modelled the process using UML and provided a comparative analysis of the two selected methods. It is noted from the analysis that RAD excels UML in its rich notations. For example, the activity diagram used in this study to represent UML does not support notations explicitly for a goal, process activation, data flows, interaction between roles, and pre-existing role, while RAD does. In conclusion, RADs are judged simpler than activity diagrams, although the latter can be used to further complement other UML analysis and design models to view the specification of a system which implements the process modelled by activity diagrams. However, Fowler (2003) states that activity diagrams are not the most widely used UML techniques nowadays, and they are also not easy to follow for domain experts.

Other examples include that of Cox and Phalp (2003) who used RAD to derive problem frames in a business process. Bădică, Teodorescu, Spahiu and Bădică (2005) used RAD along with Hybrid IDEF as integrated notations of business process modelling within the Model Driven Architecture (MDA). The aim was to approach business process modelling from either a mixed dynamic view using Hybrid IDEF, or from a more human/role-based view using RAD. The basic notation in IDEF is a black box that represents an activity with inputs and output, the Hybrid IDEF comes from an integration of IDEF0 for function modelling and IDEF3 for dynamic modelling.

When modelling using RAD, Ould (1995) suggests that the produced model can reveal current processes, and consequently can tackle any problems that might be there. He proposed four possible ways in which improvements can be applied, these are:

- (1) Point-wise improvements: these are applied to individual activities or interactions in a process. The rationale behind it is to increase the efficiency of resources or effectiveness of individual activities in a process.
- (2) Flow-wise improvements: These include changes in the order of activities and interactions within a role- in an attempt to reduce time or resource requirements.
- (3) Improvements by restructuring roles: This might lead to a reduction in the number of interactions. It also means examining the relationship between the roles and the organisation which in turn leads to a closer look at the meaning of a role. This might be helpful in this research when trying to study librarians' roles and try to apply improvements for the current processes in academic libraries.
- (4) Realigning the organisation to the process: This is considered to be the most radical change which requires changing the organisational structure itself. Operations such as delete roles, add new ones, merge and split might be needed.

When mentioning process improvements, one new term to be considered is process re-engineering (which was discussed previously in section 2.4.1). This concept involves radical changes and redesign of current processes to achieve improvements. Business process re-engineering concentrates on operational and organisational aspects, and Tinnila (1995) states that this concept revolves around one phenomenon; which is "radical rethinking of important and crucial processes to achieve dramatic improvements in several measurable operations". Prasad (1999) argues that process improvement is concerned with providing benefits related to productivity (how efficient the resources are) or performance (how effective the results are).

An empirical study conducted by Kock Jr and McQueen (1996) looked at 15 business processes involving only production activities in three organisations. The processes were modelled using two tools: flow charting and quality flow matrix, the latter describes the flow of products in a business process. It was concluded that two major implications arise from the analysis of those processes: the need for core competence, and the need for change of the business redesign focus.

The latter is relevant to this research study, in that it supports the fact that business process modelling can reveal issues that might require process re-engineering. In the above study, it was concluded that more emphasis should be given to the analysis and redesign of information flow in business process redesign projects, and the authors also claim that flow chart methods are not suitable for such modelling, as they do not address the streamlining of information flow. It is also worth mentioning that RADs support information flow between activities, while UML activity diagrams, for example, do not. (Odeh et al., 2003)

## ***2.6 Chapter two summary***

This chapter was split into four main sections according to the domain of the literature review. The first part introduced the history of academic libraries, with emphasis on the aspects relevant to the research, such as collection management and the challenges of 21<sup>st</sup> century developments. This section highlighted the main changes facing academic libraries along with the academic library response to these changes. Some academic library operations were examined as well. Surprisingly, very little published literature on academic library operations examines how and why certain functions and processes are conducted or how academic libraries are linked to essential roles and processes.

The second part of the literature discusses quality and performance measurement tools in academic libraries. The term “quality” has been used frequently in the literature, but very little extensive evaluation of performance

measurement methods is published in the peer reviewed literature. There are general guidelines, but again, little practical emphasis on processes.

The third section introduced BPM and its applications in general. Since understanding both processes and roles in an organisation is crucial, and because RAD is based on the concept of role, the third section explains the concept of 'role' and provides an overview of the changing role of librarians in academic libraries. At the end of this section, some pitfalls of BPM are highlighted.

The last part of the literature presents various business process modelling methods and some frameworks for selecting a method for a certain setting. After that, an introduction about Riva as a modelling technique was illustrated along with a justification for using it in this work. The research conducted showed that there is a need for academic libraries to do modelling to help improve the efficiency and effectiveness of their processes. On the other hand, this may partly be a publication gap as the current research, for example, indicates much of the modelling work within academic libraries was kept hidden, in internal documents only.

The first element of Riva is the PAD, which illustrates the overall chunking of processes within an organisation. The second element of Riva is the RAD which models individual processes. In summary; RAD was used for this research for the following reasons:

- Setting 'analysis and improvement' as an objective leads to choosing the 'role perspective' for viewing processes (Luo and Tung, 1999).
- Viewing business processes from behavioural / organisational perspective makes the "role" a good focus here, as staff can relate to the ideas of responsibilities (who does what) (Luo and Tung, 1999).
- RADs can be used to explore features that will enable further improvement of the current process.

As concluded from the above, Riva will be applied in this research as a modelling tool. The PAD will present the organisational processes, while the RAD will be used to model individual library processes in attempt to answer

the question: how business process modelling using RAD can help academic libraries improve their processes? RAD will be used to model, analyse and document library processes. The next chapter presents the methodology used in this research.



## **3 Chapter Three: Methodology**

### ***3.1 Introduction***

This chapter introduces the methodology and tools used in this research to collect and analyse empirical evidence. After a commentary on the literature searching strategy (Section 3.2) the chapter moves to a consideration of the main research paradigms prevalent in information systems research (positivistic vs. Phenomenological) and the reasons for choosing the research strategy adopted in this research (Section 3.3). Triangulation (Section 3.4) and transferability (Section 3.5) are important considerations for this project. Section 3.6 discusses the details of the case study design, the sampling and the approach to the data analysis. Section 3.7 reviews the ethical considerations.

### ***3.2 Commentary on literature searching***

The initial approach to the literature was to investigate what topics should be discussed in depth. Initial reading covered a huge area, then decisions were made to narrow down for the literature review to four main areas of interest. These were: academic libraries (recent trends), quality and performance measurement in academic libraries (overview of some themes relevant to this research), business process modelling (reasons for use) and modelling methods. The literature review helped to relate some of the concerns about performance of libraries, and what seemed to matter to managers of academic libraries to the possibilities for process modelling in academic libraries. The review also highlighted current changes that have affected those institutions, and how structures within libraries are changing in response to external events.

The literature review played an important role in this research as it was used to contextualise the analysis and modelling of the processes presented in chapters six, seven and eight. This is where the suggested sub-questions

come in (section 1.3). Library work is composed of processes that relate to BPM and evidence from the literature revealed that library work was suitable for modelling. The literature review also examined other methods and techniques used in academic libraries and similar organisations (to study performance) and justified the use of Riva in this research as a modelling method.

The literature was also used to contextualise the discussion and the suggested improvements in chapter nine. Further literature searching was done when analysing the processes and doing the cross case comparisons. The findings of the literature searches at that level of detail are presented with the discussion of the cases in chapter nine. The function of the literature review in Chapter three is primarily to “set the scene”. The aim was to demonstrate the status of process modelling within academic libraries, and consider whether such work formed part of the quality and performance measurement work in academic libraries. If there had been extensive research by different authors, more critical appraisal might have been possible. There was in fact little research, and much of this did not appear to build on any previous research. Where one might expect some relevant literature, on the internal processes of the balanced scorecard, for example, the findings were disappointingly lacking in detail of process modelling. Fortunately, it was possible to identify some critiques of business process modelling methods.

The literature search was carried out at Aberystwyth University library and the National Library of Wales. Targeted journals were both in librarianship and computer science, since much of the relevant business process modelling research is published in computer science articles.

In outline, the methods used as structured searching to collect the literature for the review included:

- (1) Surveying and reading resources such as: books, journal articles, previous theses, reports and conference proceedings from Aberystwyth University library where the researcher is enrolled, and has full access to a large number of resources, both print and

electronic. The main databases used were LISTA (Library, Information Science and Technology Abstracts) which is accessed via EBSCO in Aberystwyth University, LISA (Library and Information Science Abstracts) and many aggregators such as JSTOR, Emerald, ACM, Informaworld, ScienceDirect and ABI/Inform. .

- (2) Collecting information from open-access resources available on the internet such as scholarly articles, and certain institutions' and well known societies' websites, examples of such websites are: JISC and SCONUL. In addition, some information was taken from newsletters published on the website of the selected university library case studies.
- (3) Through networking and connections at conferences, and by the supervisors' recommendations, the researcher approached some people known in the field, who have interests in process modelling, in an attempt to gather information about process modelling done within academic libraries that cannot be found in published sources.

Although some literature searching was done when analysing the processes and doing the cross case comparisons, the main literature review on academic libraries and process modelling (or operations research) was conducted in 2007-2008. It might be expected that more research has been carried out on business process modelling since then, but regular updates have not revealed anything substantial to alter the conclusions.

There were many challenges during literature review development and such problems were mainly related to finding materials on processes in academic libraries. This is very important as some of the literature is not even published, but could be available in internal reports. Similarly, for the business process modelling, many of the practical examples will be sitting in consultants' reports, not in academic articles.

### **3.3 The research paradigm**

Before setting out on research, assumptions need to be examined, in particular the systematic set of assumptions about fundamental aspects of reality. A paradigm represents what thoughts people have about the world which they are not able to prove (Hale-Haniff and Pasztor, 1999) – and a research paradigm therefore governs the set of beliefs that we might have about the world, what should be understood and studied.

#### **3.3.1 Positivist vs. phenomenological**

There are two main research paradigms, and Creswell (1994) classifies them into positivistic versus phenomenological. Creswell and Plano Clark (2007) divide the two research strategies into quantitative and qualitative research. These two perspectives on research paradigms are related, as the following section demonstrates.

*Positivist:* The concept of a positivistic approach supports the idea of external existence of the social world, and measuring its properties through objective methods instead of reflection or intuition (Creswell, 1994). There is an emphasis on quantitative methods.

The typical methods used in this approach include:

- Deduction, expected facts from developed theory.
- Static design.
- Context-free, having a design valid generally, not just for the specific case studies. (Creswell, 1994)

*Phenomenological:* Supports the idea of constructing the reality socially rather than determining it objectively. Hence, the task of the social scientists should not consist of gathering facts and measuring how certain patterns occur, but in appreciating meaning that people gain by experience (Creswell, 1994). The preferred approach is therefore qualitative.

According to Creswell (1994) there are some assumptions related to the interconnections between the different features of the above research strategies, and Bryman (2004) affirms the contrasts between the two research strategies by providing fundamental differences between them. The following is a summary of the main points:

- (1) Ontological: concerned with the nature of reality. For the positivistic approach, reality is objective and away from researcher, while for the phenomenological it is subjective as seen from participants within a study. It is based on constructivist principles, which means that different people see the world in different ways. Simon (n.d.) summarized the principles of constructivism, including one that states that knowledge is actively constructed by the individual who creates beliefs from interpretations.
- (2) Epistemological: related to the relationship of the researcher to that research, and how we know what we know if the researcher is involved (as in this doctoral research). If there is interaction between the research/participants and the researcher which is necessary to identify what is to be known, then a qualitative approach is indicated, rather than a quantitative approach that would be typical of randomized controlled trials.
- (3) Rhetorical: this concerns the language of the research and reporting. The language used for reporting is formal, but using a qualitative approach, with interviews allows the use of some informal language. This is fair to the research participants, and avoids “speaking for them” which would not be acceptable in qualitative research.
- (4) Methodological: in quantitative research the process is deductive and involves testing of theory/hypotheses, which means that “generalization leads to prediction, explanation and understanding” Creswell (1994). In qualitative research, the process is inductive and theories and patterns are generated from understanding.

### **3.3.2 Information systems research**

Although information systems (IS) research has evolved for more than three decades, Chen and Hirschheim (2004) argue that few studies of the historical analysis of research paradigms and methodologies had been undertaken in this field up till the date of their paper. Orlikowski and Baroudi's survey is one of the few studies that existed. After examining 155 information system research articles published between 1983 and 1988, Orlikowski and Baroudi (1991) conclude that plurality of research perspectives is effective when investigating IS phenomena.

Since 1991, the IS research community has grown substantially and more attention has been given to paradigmatic and methodological issues. Chen and Hirschheim (2004) examined 1893 articles published between 1991 and 2001 in eight major IS journals, and found out that the positivist paradigm was dominant. The authors state that alternative paradigmatic research in IS field remains conceptual, and as a result, pluralism is encouraged. However, Chen and Hirschheim (2004) believe that if the field intended to embrace pluralism, it would have to seek ways to radically change the publication practices of the journal system and fight obstacles for the acceptance of alternative paradigms.

Richardson and Robinson (2007) criticised Chen and Hirschheim's survey for lacking the critical approach to information systems. According to Richardson and Robinson (2007) "the aim of critical research is to expose through critique of the illusions and contradictions of social existence with a view to enabling and encouraging social change". Compared to traditional managerial approaches, critical research seems to be an alternative towards understanding IS. Managerial approaches do not question the way the world operates too much. For example, the journals for academic libraries and academic librarians largely accept the parameters in which academic libraries have operated and may be likely to operate for the next ten years. By applying the critical approach however, much more interest would grow towards challenging whether some functions or processes should be carried out at all. Alternatively, some functions or processes might be outsourced, as has

happened in public libraries (Edmonds, 2012). Although Riva can be used to model and improve processes within academic libraries, and the PAD can act as a starting point to wonder about basic principles, it is difficult, however, to use it to totally overturn the way academic libraries operate (see section 10.5 for more limitations).

In research, it is important to identify how knowledge for the subject area is obtained. According to Becker and Niehaves (2007), IS research is multidisciplinary, which causes variant epistemological assumptions to be made by different researchers. The authors conducted an extensive literature review to collect original epistemological arguments specific to IS. They then developed an epistemological framework based on five questions to systematically analyse the epistemological assumptions in IS research (see table 3.1).

As table 3.1 indicates, the first question looks at ontology which refers to the object of research and the nature and existence of reality, whether researchers assume a real world independent of human cognition or dependent on human consciousness, or a mixture of both. The second question looks at the relationship between cognition and the object of cognition in that, according to Becker and Niehaves (2007): “whether entities beyond human thoughts and speech can, at least in principle, be recognized as objective”.

The third question investigates the concept of truth, how true cognition can be achieved and correct knowledge be obtained. The fourth question identifies the source of cognition capability, whether knowledge is derived from experience, intellect or both. The final question deals with the methodological aspects, how humans acquire knowledge, this can be through generalization (extension from individual cases to general ones) and that is inductive, while the deductive approach looks at deriving individual cases from the universal. A hermeneutic approach to acquiring knowledge however suggests that “the process of gaining knowledge is influenced by a circle of (previous) understanding, gaining new knowledge, and then achieving a better understanding of the entire”.

Becker and Niehaves' (2007) explicit breakdown of questions is highly related to IS research and how these questions are often discussed separately in the literature. Questions one and two in the framework are fundamental and have been discussed intensively in the IS literature (for example: Falconer and Mackay (1999); Webber (2004) in a discussion of positivism and interpretivism). Although question three of the framework (concept of truth) is not highly considered in IS research, it is mentioned in a few studies such as Weber (2004). In addition, Becker and Niehaves (2007) believe that it is important in analysing the influence of the language in research, in the modelling in general and the truth of research findings. The fourth and fifth questions are also cited in the literature, for example: Hirschheim and Klein (1989).

Becker and Niehaves (2007) framework contributed to adopting a suitable research paradigm for this research as will be seen in section 3.3.3. The framework is illustrated in the following table.

Framework question	Epistemological assumptions		
I. What is the object of cognition? (Ontological aspect)	<i>Ontological realism.</i>	<i>Ontological idealism.</i>	<i>Kantianism.</i>
	A world exists independently of human cognition, for instance, independent of thought and speech processes.	The 'world' is a construct depending on human consciousness.	There exist entities that are independent from (noumena) as well as dependent on human mind (phenomena).
II. What is the relationship between cognition and the object of cognition?	<i>Epistemological realism.</i>	<i>Constructivism.</i>	
	Objective cognition of an independent reality is possible.	The relationship of cognition and the object of cognition is determined by the subject.	



III. What is true cognition? (Concept of truth)	<i>Correspondence theory of truth.</i>	<i>Consensus theory of truth.</i>	<i>Semantic theory of truth.</i>
	True statements are those which correspond with 'real world facts'.	A statement is true (for a group), if it is acceptable to the group.	A condition for truth is the differentiation of an object and a meta-language.
IV. Where does cognition originate?	<i>Empiricism.</i>	<i>Rationalism.</i>	<i>Kantianism.</i>
	Cognition originates from the sense. Such experience-based knowledge is called a posteriori or empirical knowledge.	Cognition originates from the intellect. Such non-experience-based knowledge is referred to as a priori knowledge.	Both experience and intellect are sources of cognition. Thoughts are meaningless without content, cognitions are blind without being linked to terms.
V. By what means can cognition be achieved? (Methodological aspect)	<i>Inductivism.</i>	<i>Deductivism.</i>	<i>Hermeneutic.</i>
	Induction is understood as the extension from individual cases to universal phases, the generalization.	Deduction is the derivation of the individual from the universal.	The understanding of a certain phenomenon is influenced by the Pre-understanding of the entire/context.

**Table 3.1 Epistemological framework (Becker and Niehaves, 2007)**

### 3.3.3 Research paradigm adopted

There is a focus on communities of meaning and a great interest in knowledge and its transmission in library and information science. As a result, this field provides fertile ground for the application of qualitative research methods. Sutton (1993) states about qualitative methods in library science:

*Although these approaches raise certain problems that investigators cannot easily sidestep and must learn to manage, their benefits are considerable and include the power to generate new insights, to open up new approaches to old problems, and to broaden the range of research questions that may be usefully addressed. The opportunities for their use in library and information studies are extensive.*

As concluded from section 3.3.2 and from the adopted framework in Table 3.1, for this particular research project, the best fit (compared to Table 3.1) seems to be:

*Ontology:* Kantianism – according to the framework, this applies when there are entities dependent on human consciousness and others that are independent from human consciousness. This applies in this research since it is important to understand the noumena and the context (in terms of processes and their activities as they are) which are independent of human cognition, at the same time it is important to understand the phenomena (that are dependent on the human mind). What seems important, and what happens that is worth recording – these need to be considered.

*Relationship between cognition and the object of cognition:* Constructivism – where the relationship is determined by the subject, (for example, the choice of meanings associated with role to suit the subject, and the understanding of important elements of activities in work). The understanding of the role was gained from the research participants, not from preconceptions.

*Concept of truth:* Consensus approach applies – since a statement is true for a group if it is applicable to the group. Statements of truth in this research involve a group of certain size (people interviewed) and truth results by consensus of everyone. The model that is derived has to represent the best fit with the statements provided.

*Origin of cognition:* Kantianism – the source of cognition in this research is derived by both experience and intellect. Research data were collected, but they were not tested to fit hypotheses. The research data pertained to the work experience of the interviewees, and the way they reflected on what they did.

*Methodological aspect:* Constructivism – the methodological approach is inductive since there is an attempt to understand the common generalities from particular accounts (from individual cases).

The reality is subjective as seen from participants in the study and is based on constructivism principles. This research is qualitative as theories and patterns are generated from understanding and driven by human interests and hence, it is inductive. Results are expected to change with time according to other circumstances. Later in this chapter, the adopted research strategy will be discussed along with data collection methods used.

### **3.4 Triangulation**

Using different research methods and techniques in the same study can overcome the potential bias of a single-method. (Collis and Hussey, 1997). Denzin (1970) defines triangulation as “the combination of methodologies in the study of the same phenomenon”, and this helps to counter some of the criticisms made of qualitative research about the inherent bias.

Easterby-Smith, Thorpe and Lowe (2002) identified four types of triangulation:

- (1) Data triangulation: collection of data at different times from different sources for the same phenomenon.
- (2) Investigator triangulation: where data is collected by different researchers.
- (3) Methodological triangulation: using both quantitative and qualitative methods for collecting data.
- (4) Triangulation of theories: When taking a theory from one discipline to be used in explaining a phenomenon in another discipline. (Collis and Hussey, 1997)

In this study, data triangulation is used, as data was collected from different sources, and reviewed later by the research participants. Four different university libraries were investigated, but the only interviewer was the

researcher. The data from the sites were analysed independently, but analysis was inevitably influenced by comparisons between sites. The comparisons helped to deepen the understanding of individual sites.

### ***3.5 Transferability***

This is concerned with the capacity to apply research results to situations beyond those examined in the study. True generalisability in this research cannot be high as results will be related to a specific population in a specific environment depending on information given, and it is prone to changes in future with different circumstances (Collis and Hussey, 1997). De Vaus (2002) states that qualitative research is often criticised for lacking generalisability and being too reliant on the researcher's interpretations.

However, the application of the method itself may be transferable, and the findings may be comparable, and at the very least, allow others to ask questions about the processes in existence at other academic libraries. The differences and similarities provide opportunities for reflection on the ways things are done.

### ***3.6 The research strategy – case study design***

In social science, there are various research strategies the researcher can use to collect and analyse empirical evidence. Yin (2003) compares five research strategies as follows:

<b>Strategy</b>	<b>Form of research question</b>	<b>Requires researcher control over behavioural events?</b>	<b>Focuses on contemporary events as opposed to historical events?</b>
<b>Experiment</b>	how, why?	Yes	Yes
<b>Survey</b>	who, what, where, how many, how much?	No	Yes
<b>Archival analysis</b>	who, what, where, how many, how much?	No	Yes/No
<b>History</b>	how, why?	No	No
<b>Case study</b>	how, why?	No	Yes

**Table 3.2 Research strategies; and when to use each (Yin, 2003)**

The research strategy chosen for this research is “**case study**”. The justification for selecting this strategy is a combination of the following reasons:

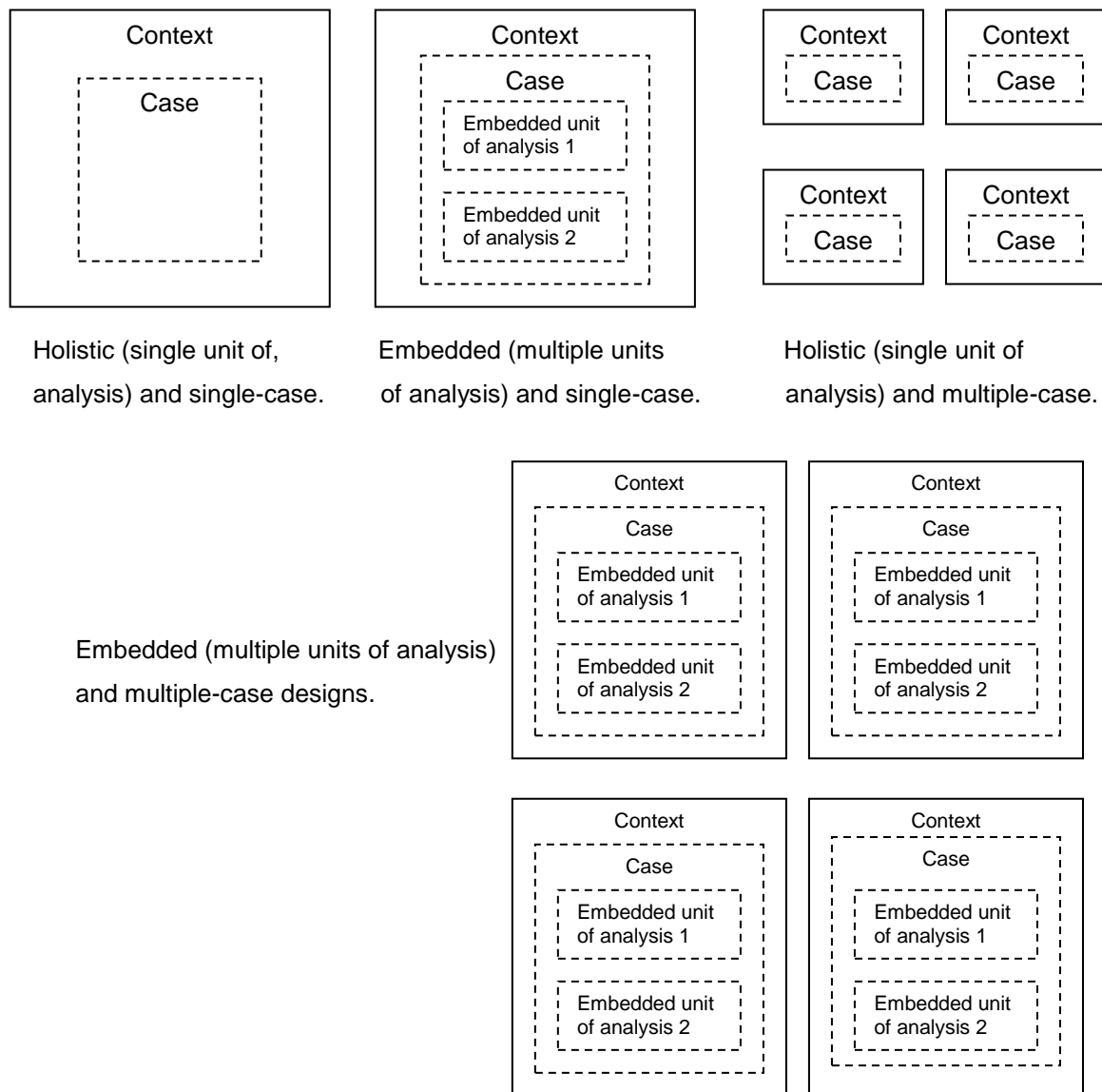
- (1) The type of research question in this research explores HOW business process modelling can be used in academic libraries to help improve their processes.
- (2) Case studies are preferred in examining contemporary events but when the relevant behaviour cannot be manipulated, unlike experiments, where the researcher can manipulate behaviour directly, precisely and systematically. (Yin, 2003).
- (3) The case study adds two sources of evidence to those used by the history strategy; interviews, and direct observation of events. Yin (2003) states about case study’s strength: “its ability to deal with a full variety of evidence – documents, artifacts, interviews, and observations – beyond what might be available in a conventional historical study”. He also states that participant observation may allow informal manipulation.

- (4) Context is central to the study. Case studies are suitable when the question posed requires investigation of a real life intervention in detail (Walshe, Caress, Chew-Graham and Todd, 2004). This is the case for this research as studying library processes in detail is crucial to understand and analyse them.

According to Yin (2003) a case study is a comprehensive research strategy that covers the logic of design, data collection techniques and specific approaches to data analysis. In terms of its scope, it is an empirical inquiry that investigates a contemporary phenomenon within its real life context.

It is essential to set up a plan for the case study, to define the set of questions to be answered throughout the research. Yin (2003) identified five components for research design: a study's question; its propositions (if any); its unit of analysis; the logic that links data to the propositions; and the criteria for interpretations of the results.

To help design a case study, one should be aware of the different types of case study design. The following are four design types. (Yin, 2003)



**Figure 3.1 Four types of case study design (Yin, 2003)**

Although case studies help understand complex social phenomenon and allow investigators to retain meaningful characteristics of real life events such as organisational and managerial processes, the case study is disdained as a research strategy by some researchers. Yin (2003) provides some reasons for this criticism: the greatest concern is the lack of rigour of case study research, with little basis for scientific generalization. In addition, when it is associated with ethnography as a data collection method, it then takes too long and results in massive documents, “case study data is time-consuming to collect,

and even more time-consuming to analyse” (Hodkinson and Hodkinson, 2001). As a result, presenting a good case study is quite challenging.

### **3.6.1 Criteria for selecting the sites, cases and processes**

The case studies are used in this research to show how business process modelling using RAD can help improve academic library processes. This represents the theory, the propositions for this research. Yin (2003) states that single case design is suitable when the case is critical or when it represents unique circumstances; which is not the case for this research. He also argues that the evidence from multiple case designs is more compelling and robust.

Although a case study might be about a single organisation, the analysis might include results about various departments or functions or even funded projects within the organisation (multiple units of analysis). It is not possible to apply multiple-case study design with single unit of analysis in this research since all university libraries selected have more than one unit of analysis (process), as will be seen later in this section. Therefore, an embedded multiple case study design (the fourth type in figure 3.1) is used in this research.

The cases discussed here are four university libraries chosen from two contrasting sites (contexts), two from Jordan and another two from the UK. Cases are named as letters followed by a number; letters to recognize the country (for example; “UK” for the British university libraries and “JO” for the Jordanian ones). Numbers however to differentiate between the two cases of one country, this makes the cases named as: JO1, JO2, UK1 and UK2. Chapter four describes the cases in detail. The units of analysis within each case are the different process groups, they are summarized in table 5.3, and these are: materials’ acquisitions, cataloguing and classification, book binding, digitization, and theses handling. These processes will be discussed in detail in chapters six, seven and eight.



The selection of two contrasting sites might provide more scope for discussion about the reasons for certain responsibilities and actions; “Each case must be carefully selected so that it either (a) predicts similar results (a literal replication) or (b) predicts contrasting results but for predictable reasons (a theoretical replication)” (Yin, 2003). Bradley (1993) also supports the selection of extreme or deviant cases. This article suggests different bases for selecting a case; intensive or information-rich cases, critical cases, homogeneous cases or case selected on the basis of theories or constructs. The cases selected for this research are capable of providing rich information. This potentially enables case comparisons regarding commonality and contrast between the libraries. Contrasting results from the two different sites selected were envisaged (Jordan and the UK). Jordan was selected as one site since the researcher is Jordanian, and hence, it was feasible to gain access and collect data. The second country selected was the UK since the researcher’s degree registration was in the UK, and much of the doctoral degree studies took place in the UK. Obviously, collection of research data at UK sites was both convenient and feasible. .

For the cases selection, the four cases were chosen purposively to reflect different academic libraries and information services. The extent of variation should be sufficient to query some aspects of processes, but not too great, as the intention was to work towards a comprehensive PAD that covers various processes. The cases selected have varying priorities, and different organisational missions, but they were all recognisable as academic library and information services – any student or member of faculty would recognise commonalities.

To be more specific, the following are the justifications for selecting the four cases:

- **JO1:** the researcher had three months training in this library before conducting this research, and became more interested in trying to improve its processes. The library staff also supported this idea. This training provided a better insight, not to bias the research, but to provide a better understanding of why things are the way they are.

- **JO2:** a well-known private university, convenient for data collection, which – given the time required for this work, was an important consideration. The managerial priorities are likely to differ from JO1 and the funding structures also differed.
- **UK1:** a small-medium university, with a converged library and information services structure.
- **UK2:** the choice of this university library was inspired by Ellis's work (1993), where the University of Sheffield was chosen because it acquired a special characteristic; the existence of a specialized research unit. For this research, one of the UK university libraries was selected as it is specialised and well known for its intensive research work. In library circles it had a reputation for organising library services in a different way. As a result, UK2 was purposively chosen as some of its work practices in the library and information services are different from traditional universities, and have been for some time.

The four university libraries selected for this research share a number of processes, which are common in almost all academic libraries such as acquisitions. However, it is noticed that some processes are not common in all libraries, for instance, binding is one of the important processes in JO1, but it does not seem to be of similar priority in UK2 for example. The following are the processes selected for modelling in this research, along with the justification for their choice:

- **Acquisitions:** a common process in all libraries. Periodicals were examined to throw a light on the different approaches that may have been developed for electronic and print periodicals.
- **Cataloguing and classification:** another common process in all selected libraries. In addition, there are variations for special collections, and some library management systems allow for the purchase of a record already done, more or less, which saves cataloguing time (and should, theoretically, be more accurate).

- **Binding:** an important process that protects books from getting damaged. It also saves space when issues of periodicals are bound in one volume. It was chosen to be modelled in this research after learning from interviews with library staff in JO1 that it is a major process with various stages, and a regular occurrence (on an annual basis in JO1). However, it is a “seasonal” process, not necessarily one that occurs all the time.
- **Digitization:** this is “a hot topic”, as indicated by the collection management team leader in UK1. Academic and research libraries have become increasingly interested in using electronic resources and therefore, converting some of their materials from print into digital format. Mugridge (2006) states that digitization projects are relatively new endeavour for most libraries. There has been a challenge in creating digital material and also in digitizing current print materials.
- **Thesis handling:** theses play a major role in the educational experience. Many institutions now believe that it is essential to make their research available to other scholars. Handling theses is a very important process as theses are now being placed in universities’ digital repositories. In fact, repository management should be a responsibility of research libraries according to an ARL report (ARL Digital Repository Issues Task Force, 2009), and Joint (2006) refers to the responsibilities of librarians for librarian-mediated deposit in universities in the UK.

Acquisitions, and cataloguing and classification processes, do occur in all cases and several RADs were created for them. Therefore, a separate chapter was needed for each one of them (chapter six and seven respectively). However, the last three processes were combined in one chapter (chapter eight) since they vary from one case to another, in other words, they do not occur in all cases., Hence, fewer RADs were provided for them. Please refer to table 5.3 for a summary of the processes studied.

Looking at a process that is tackled in a different way in different institutions provided the researcher and the research participants with questions about

the reasons why certain roles are associated with particular activities. For example, looking at the acquisition of electronic materials provided an insight to examine how library functions might be changing or need to change. This will be further explained in section 6.7.

### **3.6.2 Data collection methods and tools**

Collecting the evidence for case studies can be conducted using six sources as suggested by Yin (2003): documents; archival records; direct observation; participant-observation; interviews; and physical artifacts. For this research, the following methods were used to collect the evidence:

#### (1) Documentary information:

This includes letters, proposals and progress reports, newspaper clippings or articles appearing in the media, formal studies and evaluations of the site. Documents are helpful in verifying the correct spellings, titles and names of people or organisations that might have been mentioned in an interview. They can also help researchers make inferences (Yin, 2003). However, they are usually written for a specific audience and they are not interactive.

For this research, as much documentary information as possible was gathered, in an attempt to provide a good background to understanding the processes, and hence, to build the PAD and RADs. Library staff were asked about any possible documentary information that could be obtained and of help to this research, the documents gathered are summarized in table 3.3. Please note that only one document was appended (appendix 3). All other documents cannot be appended since they show organisation and staff names, which is contradictory to the third point (confidentiality of information) of the ethical procedures discussed in section 3.7.

Case under study	Documentary information	Notes
JO1	Grand total of the student body according to gender for the academic year 2007/2008. Obtained from acquisitions	The statistical report that holds information about: number of titles in the library, number of students in the university, reading halls acquisitions (parts of the reports that can be shown are in appendix 3)
	Thesis submission form. Obtained from theses acquisitions	Form filled in by the student and contains information about both the student and the thesis
	Daily press report issued by Media and Public Relations Department (2009). Obtained from head of serials and e-resources division	includes various topics, one of them is about electronic periodicals in JO1
UK1	Digitization procedure notes, from a lending services team member	Notes describe detailed activities and steps taken when digitizing material. Such material, along with information gained through interviews, helped in producing the digitization RAD
	Copyright Notice form, obtained from a lending services team member	This helped to explain what happens when digitization is requested
	Request form for scanning material from a lending services team member	This shows information needed when requesting the scanning of some material
	Ordering procedures for periodicals, obtained from a member of staff in materials acquisitions	Showed the steps for ordering periodicals and helped in producing the RAD for this process
	Order and cancellation checklists obtained from a member of staff in materials acquisitions	This helped to explain what kind of information is needed when ordering/cancelling material
	Collection management policy, from the collection management team leader	To illustrate collection management team tasks

**Table 3.3 Documentary information collected from some cases**

## (2) Archival records:

According to Yin (2003), these include organisational records, for example, organisational charts and budgets allocated and spent over a period of time. They also include maps and charts of the geographical place, personal records such as diaries, list of names, service records and survey data. For this research, as mentioned previously in point two (documentary information), as many archival records as possible were gathered to provide a comprehensive set of background material to understand the processes, and hence, to build the PAD and RADs. Library staff were asked about any possible archival records that can be collected, as archival records can be very useful to a case study, but as it is not always easy to access them, there is the problem of authenticity. Important archival records to refer to are the work flow diagrams that were prepared by some librarians to represent processes. This is very important because as mentioned at the end of section 2.5, this suggests that although these charts are not published externally, some libraries have thought of modelling their processes. The archival records that the researcher could get hold of are listed in the following table. Just as in the example of documentary information, some of these archival records cannot be appended since they show organisation and staff names, which is contradictory to the third point (confidentiality of information) of the ethical procedures discussed in section 3.7. However, other records such as organisational charts can be found in appendix 3.

Case under study	Archival records	Archival record features
JO2	List of databases that JO2 has subscribed to	The list includes all 17 databases along with information about each
UK1	Flow chart from a lending services team member	This represents the ordering process for digitization
	Flow chart from the support services manager	This represents the digitization request process in the previous university library the support services manager used to work for
UK2	Flow chart from an information advisor in acquisitions	This represents the book ordering process
	Hierarchal structure for UK2, obtained from the head of information systems	UK2 hierarchal structure was noted to be different. The structure given included staff names and where each is located
	Brochures collected from the help desk, these were about: welcoming notes to students, students off site service, and e-research repository	This helped in building a good picture about the university and its library, and how the library supported the mission of the university.

**Table 3.4 Archival records collected from the cases**

### (3) Semi-structured Interviews:

Interviews are an essential source of information in case studies, and they often work as guided conversations rather than a structured set of queries. “Although you will be pursuing a consistent line of inquiry, your actual stream of questions in a case study interview is likely to be fluid rather than rigid” (Yin, 2003). In case study interviews therefore, open-ended interviews are the most popular option, as suggested by Yin (2003). The interviewee may propose their insights into certain matters, they can also suggest other candidates to interview, and, moreover, the questions asked are prone to changes according to the information provided by the interviewees. This allows flexibility in the process. Although a number of library staff were pre-selected for this research, the further sampling benefited from some interviewees’ suggestions about interviewing other people within the library.

The selection of sites – two contrasting sites, in contrasting countries, Jordan and the UK – and the selection of cases were justified in section 3.6.1. However, the sampling strategy adopted for selecting library staff to be interviewed from the four cases is derived from Miles and Huberman (1994) framework, which introduces a set of criteria to evaluate sampling strategies. The strategy for selecting library staff in this research relates to the second sub-question of this research about processes. The strategy was to select informants from various levels, for instance, managers and standard (front line) employees. The strategy also stresses selecting people that can add value by providing rich information about various library processes and their detailed activities, since the main concern of this research is to improve these processes.

According to Miles and Huberman (1994), the set of criteria to evaluate the sampling strategy is:

1. *The sampling strategy should be relevant to the conceptual framework and the research questions addressed by the research.* The choice of library staff from various hierarchal levels enabled comprehensive coverage of the needed processes, the managerial level was able to provide the researcher with the list of processes that can and should be modelled, the frontline staff provided the details.
2. *The sample should be likely to generate rich information on the type of phenomena which need to be studied.* Curtis, Gesler, Smith and Washburn (2000) states that “intensive research depends on the collation of ‘thick description’ of the phenomena which are conceptually important”. The selected strategy included library staff from different teams, including technical staff and people who are involved in everyday processes. Those people were able to provide rich information about the processes and their detailed activities.
3. *The sample should enhance ‘generalizability’ of the findings.* To make statements about a population from a sample in qualitative research, analytic generalizability is used rather than statistics (Curtis et al., 2000). However, as was mentioned in section 3.5, transferability is a



more suitable term to use since the method used in this research is transferable. Generalizability cannot be high unless it could be shown the other university libraries are similar to the cases studied.

4. *The sample should produce believable descriptions/explanations.* This implied the reliability of the sources' information and whether they are complete or not. Curtis et al. (2000) argues that this criterion looks at whether the sources of information are subject to important bias. For this research, information collected from library staff was complete and unbiased; it was also the base for building the RADs. There was no reason for the library staff to be untruthful in their responses, and some verification was usually possible.
5. *Is the sample strategy ethical?* Consent was gained from all participants before conducting the interviews. The research was conducted in a way that meets ethical standards; especially that it is qualitative research that involves human participation. The Framework for Research Ethics (FRE) was applied to sustain good ethical practice. It is explained in more detail in section 3.7.
6. *Is the sampling plan feasible?* The sampling strategy was compatible with the work style required for conducting the research. Although the time allocated for collecting the evidence limited the number of cases selected to four, the sampling strategy for selecting library staff was feasible in terms of cost and time. The travelling between the sites to meet interviewees was arranged as and when meetings were convenient to both parties. The time allocated for each interview was adequate (between 30 to 75 minutes). In cases where queries emerged later, interviews were re-arranged either by revisiting the site or by email when the site was too far and therefore no longer possible to revisit. Curtis et al. (2000) adds to this the competencies of the researcher, to communicate in a mutually appropriate and effective manner.

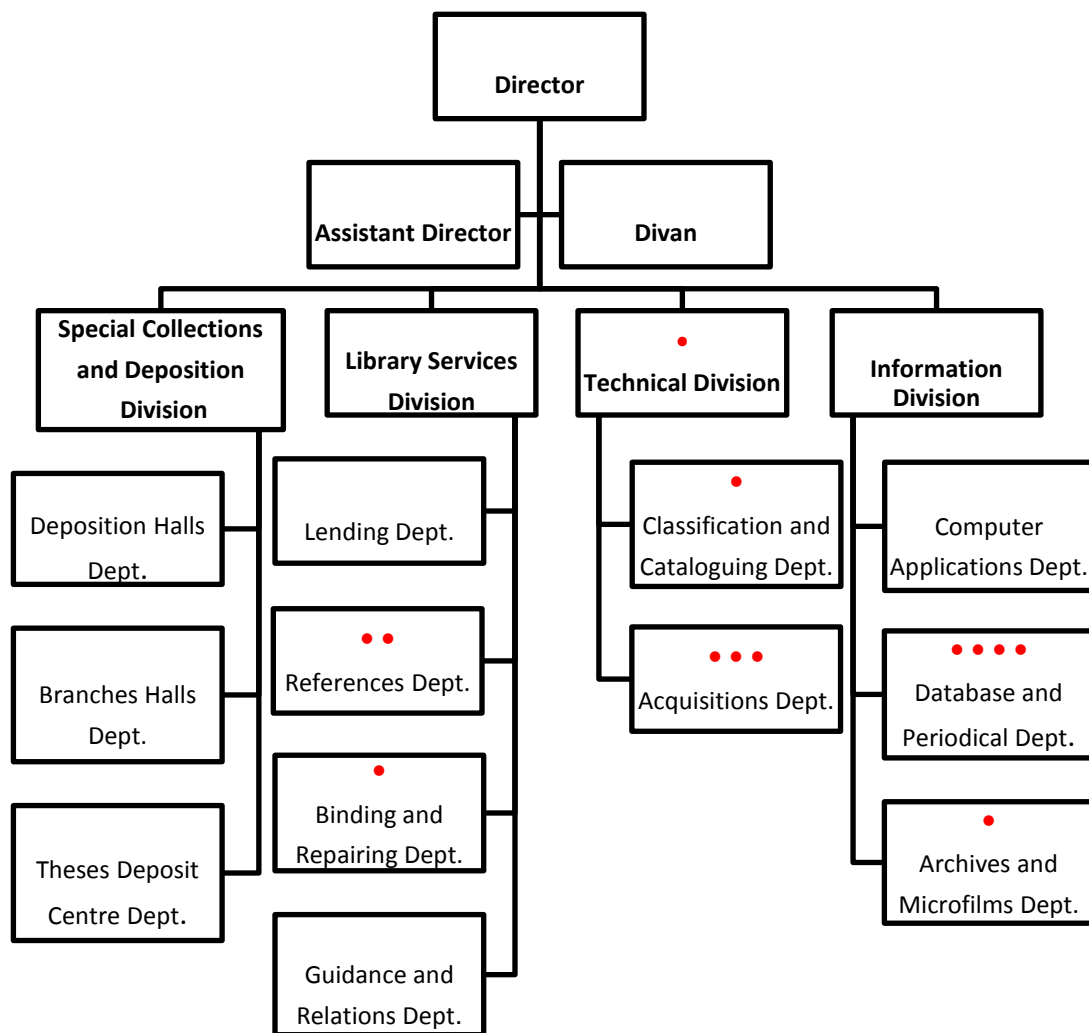
Coming to the interviews, Bryman (2004) refers to this type of interview (the open-ended interview) as semi-structured, in which the interviewer has a list of questions to follow (as a guide) or some topics to be covered, but the

interviewee has a great deal of leeway in how to reply. This was very useful for this research, especially as the researcher did not come from a librarianship background. That made it fundamental to gather information from related specialized stakeholders in depth as they could contribute to a full understanding of the events, patterns, processes and forms of behaviour (please refer to appendix 4 for interview guides).

Bradley (1993) states that “people are the direct sources of data when the researcher interacts with them”. Of course one should be cautious about becoming totally dependent on key interviewees, as they may subconsciously omit information that could reflect badly on them. This risk can be minimised by using other, complementary sources of evidence.

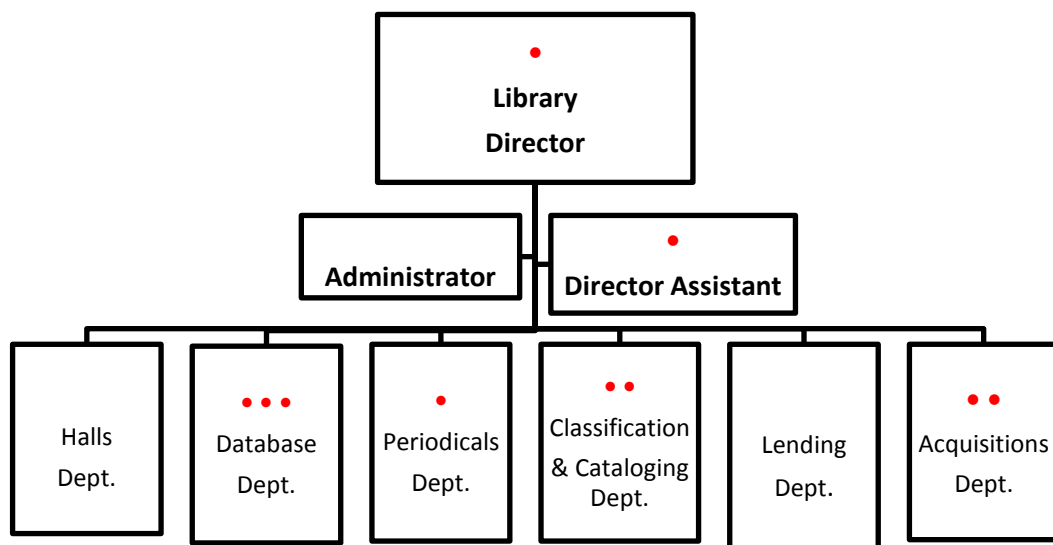
For this research, the researcher conducted interviews ( $n = 47$ ) with library staff to learn about library processes. The following is a detailed breakdown of the number of interviews conducted in each university library, accompanied with the hierarchal structure for each case to refer to the sampling strategy - the selection from various levels. The red dots in the figures refer to the number of library staff interviewed, whereas any blue dots refer to those interviewees who cancelled. Note that there are some block labels written in bold as they refer to a division or team (for example: technical division in figure 3.2), if there is a red dot there, then this means that the interviewed person is the head of this division.

**JO1:** 13 interviews with library staff from different levels, including technical and managerial staff. The interviews were arranged personally through the library administration and the site was visited three times to conduct the interviews, in summer 2008.



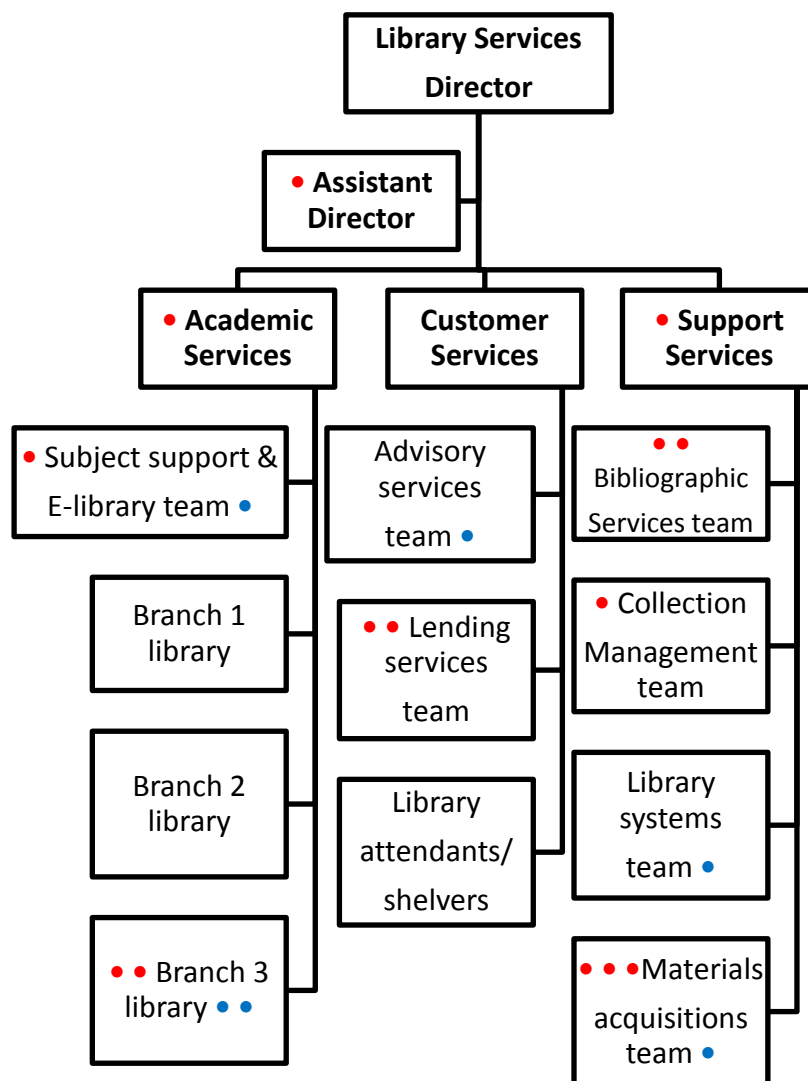
**Figure 3.2 JO1 hierarchal structure including red dots referring to people interviewed**

**JO2:** Ten interviews were conducted at JO2. The interviews were arranged personally with the library director and two official site visits were made in April, 2009. A further visit was made, a few months later, to confirm some information, and to answer a few queries that emerged during the analysis phase.



**Figure 3.3 JO2 hierarchal structure including red dots referring to people interviewed**

**UK1:** Interviews were arranged directly with members of staff after the research gained general permission from the library director. Emails were sent to 20 members of staff, 14 replied and confirmed date and time for the interviews, however, three did not respond to the email. One explained that her work was not related to the research area, another said there was not enough time to schedule an interview, and one cancelled after setting a date. This has not affected the quality of research as the risk of refusal was taken into consideration before contacting potential interviewees. Several people with the same job role were contacted. The interviews were conducted at the site on the date and time arranged by the interviewees (from October 2008 to February 2009).



**Figure 3.4 UK1 hierarchal structure including red dots referring to people interviewed and blues ones referring for people who cancelled**

**UK2:** Interviews for this case were arranged by email via the library director and the administration according to staff availability. The researcher visited the site three times in July 2009 and conducted ten interviews. However, one member of staff was interviewed again, but via email this time (as the site was not very easy to revisit), to explore the cataloguing and classification process in more detail.

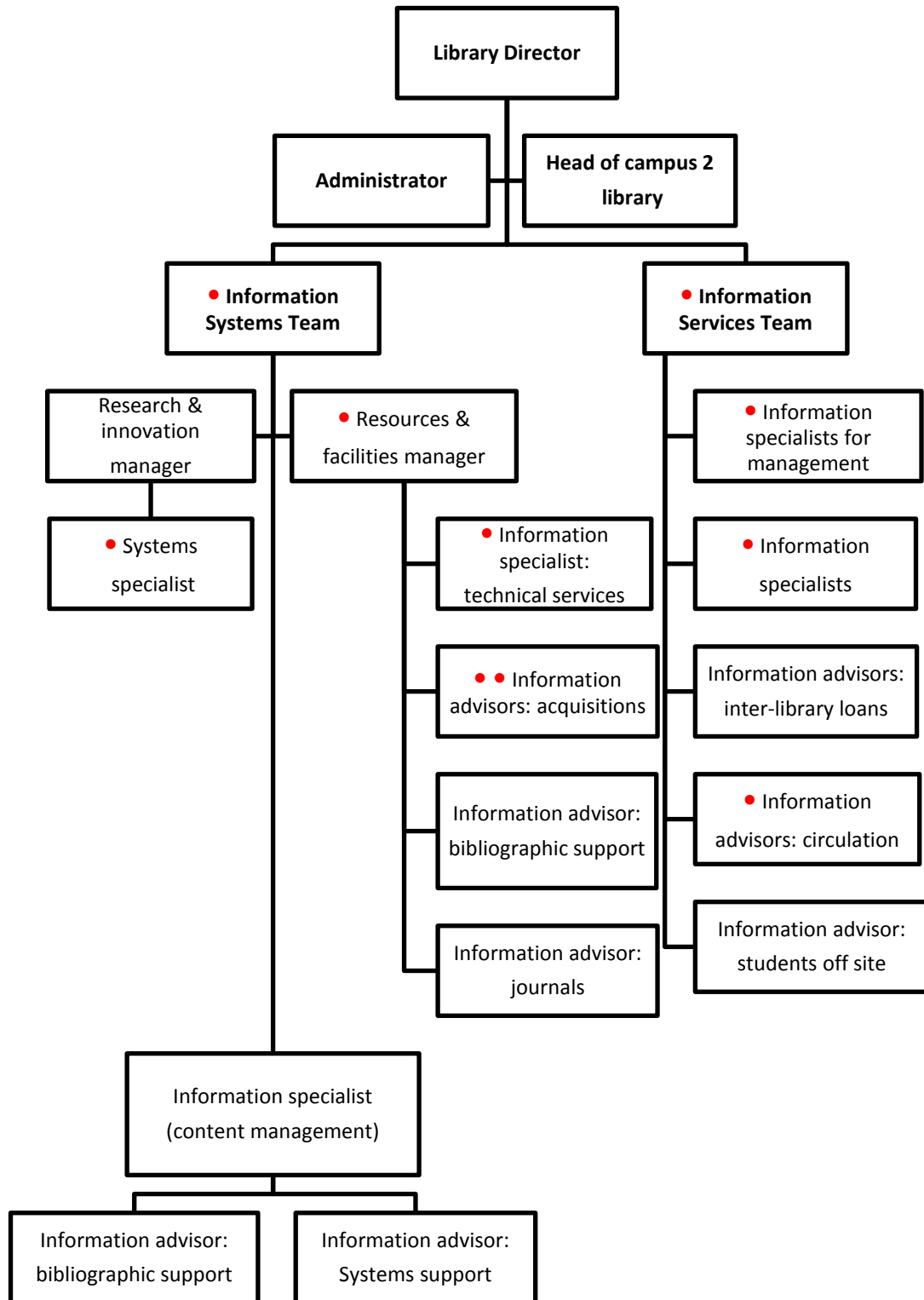


Figure 3.5 UK2 hierarchal structure including red dots referring to people interviewed

In summary, 53 people were invited for interviews, and of these six did not respond or cancelled. The range of the length of the interview varied between 30 minutes to 75 minutes. All interviews were conducted in confidence, with information shared only between interviewee and interviewer. Interviewees were selected from various hierarchal levels in the libraries and the reports, transcripts, and quotations were all anonymised, and not individually identified in this work. Although in some cases, roles can be uniquely identified or there was only one person with a role, anonymity is still assured as the institutions (university libraries) were also anonymised in the thesis. The information gathered was kept securely and used only for analysis and modelling purposes.

Interviewees were asked specific but flexible questions and were also given the chance to propose their insights. The content of the interviews varied according to the different levels of library staff, at the management level for example, the questions focused on the identification of the processes that exist in the library, identification of key people responsible for certain processes, the major challenges and problems the library faces, budgeting issues and other decision making processes. Questions related to detailed activities within the processes and any concerns regarding day to day work were best answered by employees and team members. Please refer to appendix 4 for full interview guides. These interview guides acted as a guide and a reminder of the topic and the important points that should be covered rather than a structured list to follow, and they were followed up with supplementary questions when it was necessary to obtain further details. The questions asked were related to process modelling and so they were concerned about things like: who is involved here, what happens next, is there a time limit, are there alternative routes, etc... It must be stressed that considerable flexibility was applied in the interviewing process to suit the interviewee, for example, a question like: "to which team do you belong?" carried several answers, some interviewees answered it fully and included extra information (such as number of members within the team), while others provided short and precise answers, this in turn affected the following questions, so when answers were short (for example: "acquisitions team"), more questions were pulled out such as "how many are you in the team?" and

“How long have you been working here?”, such extensions of questions depended on how general and detailed the interviewee’s answer to the main question was.

Permission was gained from all the library directors for interviews for the research. An information letter explaining the research topic, and a consent form were distributed to members of staff prior to the interview (Appendices 1 and 2). Interviews with library staff in the UK were recorded as English is not the researcher’s first language. Consent was gained from all interviewees to record the interviews except for two interviewees from UK1 who were not happy with the recording. In these cases, notes were taken carefully and then written up immediately after the interview. Yin (2003) states that recording interviews provides more accuracy. However, if recordings are not possible, then notes need to be taken carefully and written up soon after the interview. Interviews were conducted in Jordan in Arabic as this was necessary to establish rapport and make the interview process comfortable for the interviewee and informative for the interviewer. Library terminology was translated directly from Arabic to English, and this did not cause problems.

There were some inevitable limitations. First of all, staff could change roles or positions throughout the research period. Secondly, in some cases, the researcher had to wait some time before all arrangements for the interviews were complete which made the research schedule somewhat reliant on the interviewees’ responses at the time of the interview. There may be some periods of the year when library staff might feel more willing to spare the time for such discussion, but the schedule could not always take advantage of that. Finally, there were some problems in following up queries after the interview. There was some difficulty in chasing up someone in UK2 to learn about their cataloguing and classification process, which caused some delay in finishing the modelling phase for that specific unit of analysis, until information was obtained via a short email interview.



#### (4) Direct observation:

Informal observations were observed consistently in the cases. This method was used occasionally in this research as a less formal method. Informal observations were made throughout the field visits. Aspects such as the condition of the buildings and the organisation of the workspace are examples of such observations. Direct observation differs from participant observation in that the former takes a passive position rather than occupying a role within a case study (Yin, 2003). As the researcher was trained in one of the Jordanian University libraries under study, this provided some background knowledge of the way in which libraries in Jordanian universities might operate. This training will be referred to again in the next section.

### **3.6.3 Data analysis methods**

There are several methods used to analyse data in social sciences. According to Kassarian (1977) content analysis is a method of analysing human communication messages, and it looks at the quantitative description of the manifest content of communication. Grounded theory is another method for analysing data. Mills, Bonner and Francis (2006) define grounded theory as “a methodology that seeks to construct theory about issues of importance in peoples’ lives”. These issues emerge through the stories participants tell to the researcher. The procedures followed in this research to analyse data are not based on content analysis – although documents are gathered from the four cases to check the truth of some statements (such as hierarchal structure or list of steps for a certain process). Grounded theory is also not the adopted method since according to King (1998) grounded theory uncovers the real beliefs and values of participants, which is not compatible with a constructionist approach especially as all interviews followed a guide to make sure all aspects of the process were covered. This imposed some structure on the type of information and opinions gathered, and the emphasis was on reaching a shared understanding of the steps involved in the process.

The richest source of information in this research was interviews with library staff, which have generated long narrative texts. Narrative analysis seems to be the best fit as an analysis method for this research. The related analysis techniques used were coding and highlighting. Narrative analysis helps the researcher understand the participants' experience and its relationship with their social framework. Blom (2010) argues that narrative analysis is particularly important when the researcher attempts to understand human work as mutual understanding is a crucial point for the results. For this research, it was important to understand the human work within the selected cases before proceeding with modelling processes.

Riessman (2003) states that narratives can refer to an entire story woven from interviews and observations, but they can also refer to specific stories organised around certain setting and characters or long sections of talk that develop over a course of multiple interviews. The latter seem to represent the situation in this research, where multiple interviews were conducted resulting in long narratives. Riessman (2003) suggests that interview transcripts should go through closer inspection. They require interpretation since they are used as data in social sciences.

There is a range of models for narrative analysis, but according to Riessman (2003), the boundaries to these models are fuzzy, in that they often can be combined. The models for analysis are:

1. *Thematic analysis* - where emphasis is on what is said rather than how it is said. This is similar to grounded theory in that the researcher collects many stories and inductively creates conceptual groupings of data. In this model of narrative analysis, the researcher organises narratives by theme: "A typology of narratives organised by theme is the typical representational strategy, with case studies or vignettes providing illustration" Riessman (2003)
2. *Structural analysis* – emphasis is shifted towards the way a story is told. Language here is treated seriously unlike the thematic analysis.

3. *Interactional analysis* – interest here is shifted towards how the listener and the teller construct meaning collaboratively, and investigates the dialogic process.
4. *Performative analysis* – where story-telling is seen as performance, action or “doing” is added to “telling”.

Thematic analysis was adopted in this research, where the focus was mainly on what is said rather than how it is said. Narratives were organised in themes, for example, information about acquisitions as a process was gathered from different library staff (mostly through interviews with members of the acquisitions team), such narratives were grouped under one theme, that is of acquisitions in a single case study, so each case would have the ‘acquisitions theme’. These themes were at a later stage compared to each other to compare the same process in different cases.

Grouping narratives under one theme in thematic analysis involves the creation of codes. Bryman (2004) refers to coding as a basic starting operation in qualitative data analysis, it investigates each piece of data in order to classify it within a category that provides descriptive information about the units included. As the number of interviewees was large, and long narratives were produced, the following steps – derived from Bryman (2004) – were followed in attempt to analyse the data gathered for this research:

1. As mentioned before, interviews with library staff in the UK were tape-recorded. They were then written electronically on a word document after listening to them carefully. Interviews with library staff in Jordan however were already in the form of paper transcripts. They were also converted into electronic form. These together generated the interviews transcripts
2. The transcripts were read carefully and important relevant information was highlighted by changing its colour to blue (see appendix 5)
3. When transcripts were read through for the second time, notes were taken (memos and codes), as suggested by Bryman (2004), where it is advised to take marginal notes or remarks about data, respondents or

anything of interest (as memos). Coding facilitates organisation of data and reveals patterns and relationships. Examples of codes taken were: process steps, role of subject librarian, the merge problem, challenges, etc... Some codes were also used to refer to blocks of text that can be used later as quotations. According to Bryman (2004), coding is an important part of analysis, it is a mechanism to reduce the large amount of data collected and help thinking about its meaning. As can be seen in appendix 5, memos for electronic transcripts were done by adding notes in red and highlighting codes in blue.

4. At this stage, after intensive coding, categories started to get clearer, so connections between concepts and categories were developed such as finalising the number and type of processes. Some connections were also related to the literature, for example, how the challenges faced in some cases are linked to those major challenges and problems existing in the literature. For a coding example, please refer to appendix 5, note that names were removed and brackets were used instead to indicate that a name was mentioned. Any text that might refer to an identity of an institution / a person was also removed and replaced with ellipses (...).

In addition to the above, after listening to the interviews carefully, some sample diagrams – on paper – were created in the early stages as a way of verifying and rechecking the transcripts, to make sure that all needed information was gathered, for example, drawing a simple diagram (ovals and arrows) to check the process of acquisitions and the order of activities within it. These were not used formally in the research but were helpful in the analysis stage for verifications.

During the analysis process, data was analysed and interpreted in a way that makes sense rather than just paraphrasing it. Checklist criteria were followed to ensure satisfactory analysis (Braun and Clarke, 2006):

- For transcripts – data have been transcribed accurately against the tapes and at an appropriate level of detail

- For coding – all units of data have been given equal attention, coding was comprehensive and themes were generated from all examples. Themes are consistent and have been checked against each other and against the original data.
- For analysis – data was interpreted in a way that makes sense rather than just paraphrasing. A balance is kept between analytic narrative and illustrative extracts.

After data was gathered and analysed, important information, relationships and patterns were revealed, a clear understanding of the business was also perceived, and these elements were used to create the RADs to represent processes. Ould (2005) states that clear understanding of the business should be perceived in order to create the RADs. Several drafts were created to come up with final models of processes. The process models provide a ready-made structure that allows further checking of the truth of narrative and any interactions, they also helped in checking out meanings. The models were also analysed at a later stage to reveal process improvements, as will be seen in chapters six, seven and eight. These small discussions were then integrated and extended to form an overall discussion in chapter nine.

### **3.7 Ethical issues**

According to Economic and Social Research Council (ESRC, 2010), research should be designed and conducted in a way that meets key ethical standards, especially in social science which is broad-ranging and often involves human beings. As mentioned in section 3.6.2, the FRE is intended to set out the ESRC's approach, and to sustain good ethical practice.

The following are the six key principles of ethical research that the ESRC expects to be addressed whenever applicable, along with how each principle was applied in this research:

- “Research should be designed, reviewed and undertaken to ensure integrity, quality and transparency”. In this research, the research proposal

was approved by the Departmental ethics committee, and a copy sent to Academic Office within the University.

■ Research participants must normally be informed about the purpose and methods used. They should also know whether their participation in the research entails any risks. “Some variation is allowed in very specific research contexts for which detailed guidance is provided in the policy Guidelines”. As mentioned in section 3.6.2, the information letter and the consent form can be found in appendices 1 and 2 respectively. These were distributed to interviewed library staff in advance. The information letter explains the nature of research. The consent form however, provides a checklist of terms and conditions and requires interviewees’ signatures.

■ “The confidentiality of information supplied by research subjects and the anonymity of respondents must be respected”. The following points support the application of this principle in this research:

- University libraries were anonymised as well as interviewees and their responses.
- The data gathered was kept securely and was used only for analysis and modelling purposes.
- Coping with some people who were not happy with recording of interviews. Notes were taken instead.
- Although some quotes were included in this research to support certain discussions, the main basis for modelling was the data derived from the analysis, not the direct quotes.

■ “Research participants must participate in a voluntary way, free from any coercion”. No one was forced into interviews, interviewees’ participation was entirely voluntary and they were given the right to withdraw at any time throughout the research without having to provide a reason.

■ “Harm to research participants must be avoided in all instances”. As will be seen later, some of the results in section 6.7 listed under ‘improvements by restructuring roles’ indicate that the administration role in can be considered third party in between other roles’ interactions, which does not add much

value to the process. This reveals unnecessary tasks undertaken by this role that can be removed to shorten process time, but it does not cause harm to the role as the role still has other activities to perform.

■ “The independence of research must be clear, and any conflicts of interest or partiality must be explicit”. As mentioned in section 3.6.1, the researcher was trained in one of the Jordanian university libraries selected for this research for a three month course. The training involved exploring the library’s system, discussing its processes and watching staff working on some processes. This experience deepened the interest in analysing and improving library processes. Therefore this training before conducting this research gave me, as a researcher, a better insight, not to bias the research but to provide a better understanding of why things are the way they are. The experience also revealed the desire that some members of staff have for change.

### ***3.8 Chapter three summary***

This chapter introduced the research strategy and methods used in this research. This research is qualitative as theories and patterns are generated from understanding and driven by human interests; hence, it is inductive. The reality is subjective and based on constructivism principles. Case study design is a comprehensive research strategy that covers the logic of design and data collection techniques. It is used in this research where an embedded multiple case study design is chosen.

The cases discussed here are four university libraries chosen from two contrasting sites (contexts), two from Jordan and another two from the UK. This selection might provide more scope for discussion about the reasons for certain responsibilities and actions. Four cases were chosen purposively to reflect different academic libraries and information services in attempt to develop a comprehensive PAD that covers various processes. The cases selected have varying priorities, but they were all recognisable as academic library and information services. The processes selected however are common in almost all academic libraries such as acquisitions, although it is

noticed that some processes are not common in all libraries (such as binding). Section 3.6.1 provided detailed justification for selecting the processes.

The data collection methods used were documentary information, archival records, semi-structured interviews and direct observation. Forty seven ( $n = 47$ ) interviews were conducted with library staff to learn about library processes. An information letter explaining the research topic, and a consent form were distributed to members of staff prior to the interview (Appendices 1 and 2). Interviews with library staff in the UK were recorded. The interviews were of the open-ended type, in which the interviewer follows a guide but with a great deal of flexibility. The sampling strategy adopted for selecting library staff to be interviewed from the four cases is derived from Miles and Huberman (1994) framework, which introduces a set of criteria to evaluate sampling strategies (section 3.6.2). Informants were selected from various levels, for instance, managers and standard (front line) employees. The strategy also stresses selecting people that can add value by providing rich information about various library processes and their detailed activities.

Thematic analysis was adopted in this research, where the focus was mainly on what is said rather than how it is said. Narratives were organised in themes. Transcripts were read carefully and analysed by adding codes and memos to find out relationships, subjects and patterns.



## 4 Chapter Four: Cases under study

### 4.1 *Introduction*

This chapter introduces the four cases selected for this research. It provides a general view of these libraries, a brief history, their size and their organisational structure. A summary is illustrated in a table at the end. The information in this chapter shall help the readers to build an impression about these libraries and fit various processes into them. Universities and university libraries are subject to many external pressures and they interact with each other and with other agencies in several collaborative activities which inevitably affect how the libraries view their mission, their priorities and how they might organise internal processes. Accordingly the introduction to the cases explains some of the background to recent collaborative activities, and compliance with quality assurance work at all the cases.

The cases selected for this research are four university libraries, two from Jordan and two from the UK. The limitation of the number of cases and the choice of these two contrasting sites corresponded to my situation while conducting doctoral research studies (based partly in the UK and partly in Jordan). Moreover, having two different systems allows comparison of the way processes are organised. Last but not least, such work requires the establishment of trust, which takes time and therefore limited the choice to four cases. For two of these gaining access was easy as trust had already been established. Fortunately, the other two sites which I approached were happy to participate in this research and interested in the results (which were shared with them).

All interviews were conducted in confidence, and with assurances of anonymity and therefore, no names are mentioned in this work. As mentioned in section 3.6.1, the four university libraries shall be referred to using the first two letters of the country name followed by a number:

Case 1 (Jordanian university library) → JO1

Case 2 (Jordanian university library) → JO2

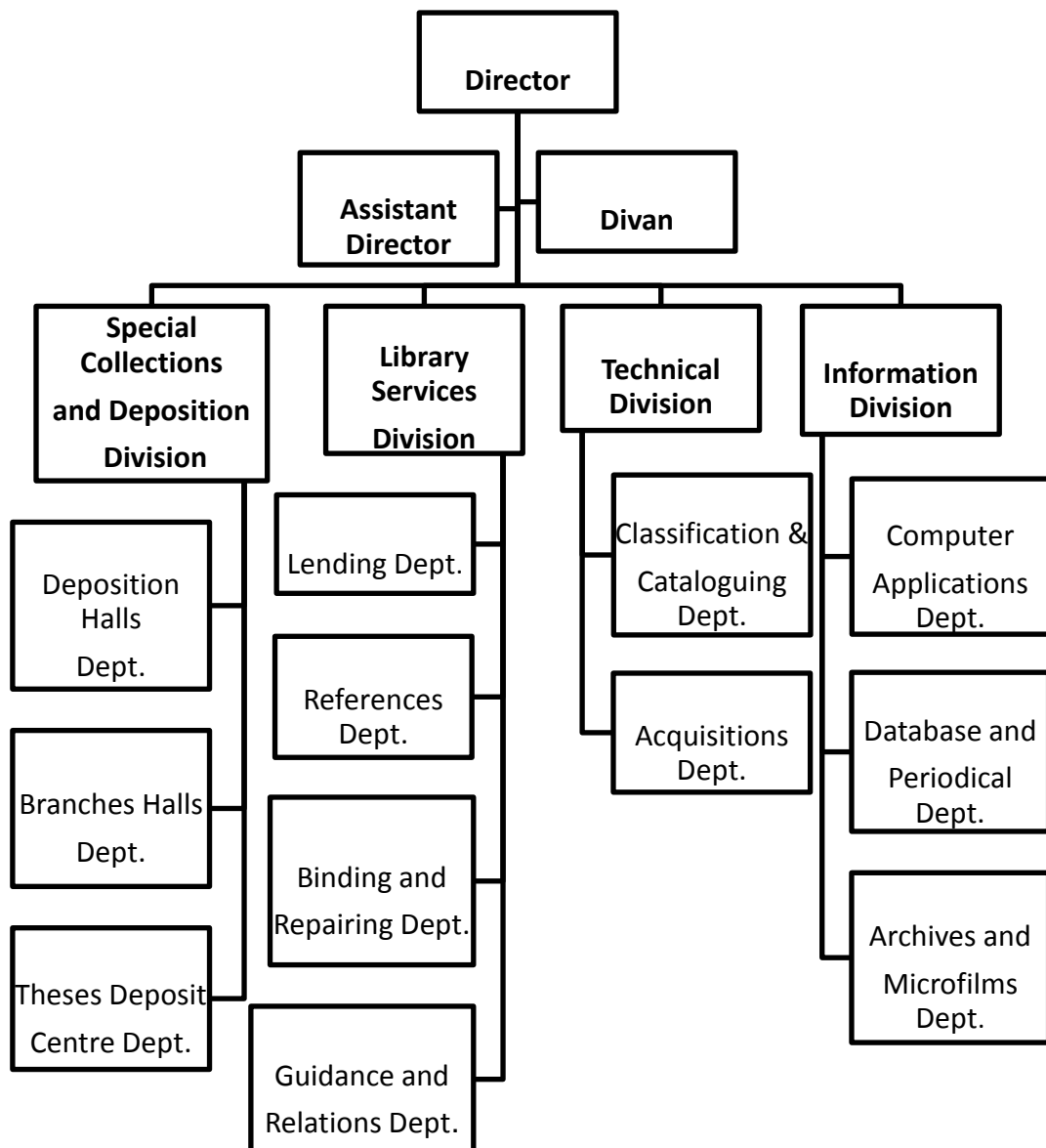
Case 3 (UK university library) → UK1

Case 4 (UK university library) → UK2

## **4.2 Case one (JO1)**

The first case is a university library in Jordan (JO1). This university is one of the biggest and oldest public universities in Jordan. It embraces 18 faculties located in one big campus. It offers a wide range of programmes, both of undergraduate degrees and higher education. The university's main mission and objective is to provide excellent quality of education at both undergraduate and postgraduate levels, with adaptation of democracy in education and decision making processes. The university has a medium size student population of about 34,000.

The JO1 is also of the biggest academic libraries in Jordan, it has around 900,000 library items, available for students, academic staff and researchers. The library embraces all types of resources such as books, journals, newspapers, theses, microfilms, and more. It was established in 1962. Following is a figure that represents the JO1 organisational structure:



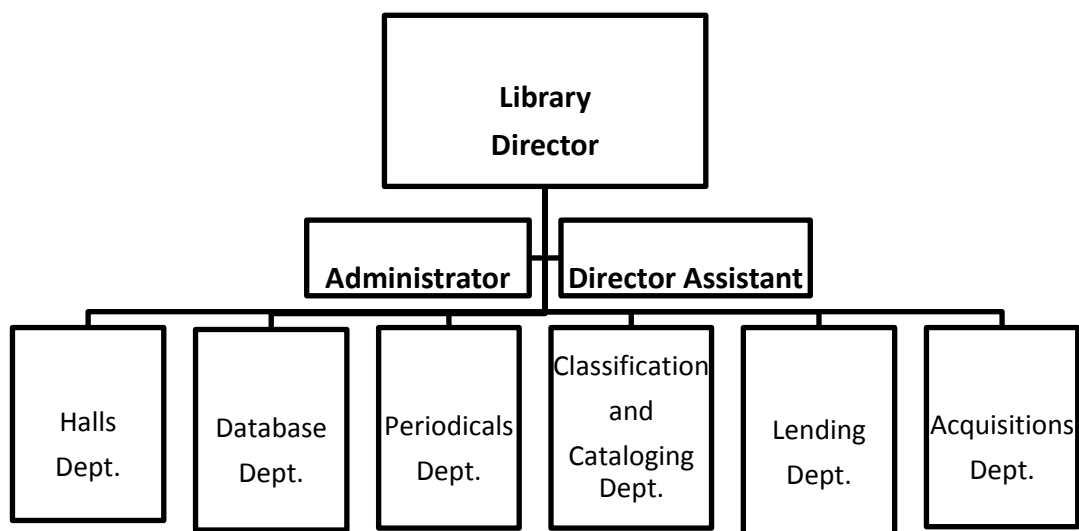
**Figure 4.1 Organisational structure for JO1**

### **4.3 Case two (JO2)**

The second case selected for this research is also a university library in Jordan (JO2). This university is a new medium size private university, but considered one of the biggest private universities in Jordan. It was established in 1991. The university embraces 5 faculties: Arts and Science, Architecture,

Administration and Finance, Pharmacy and Medical Science, and Information Technology, all located in one campus. The university offers a range of programmes, mostly undergraduate degrees, but it also offers master's degree in some specialities. The university aims to provide a good level of education, and to achieve developments especially in information technology field, it also seeks to enhance students' critical thinking and develop their understanding of responsibility. The university has a small student population of about 5,400.

The JO2 is a library that serves the university's needs. It was established in 1991. There are 20 people working in the library, including head of departments, librarians, administrators, and supervisors. The library has around 62,000 titles, but can keep up to 100,000. These are available for students, academic staff and researchers. The library embraces different types of resources such as books, journals, newspapers and theses. Following is a figure that represents JO2 organisational structure:

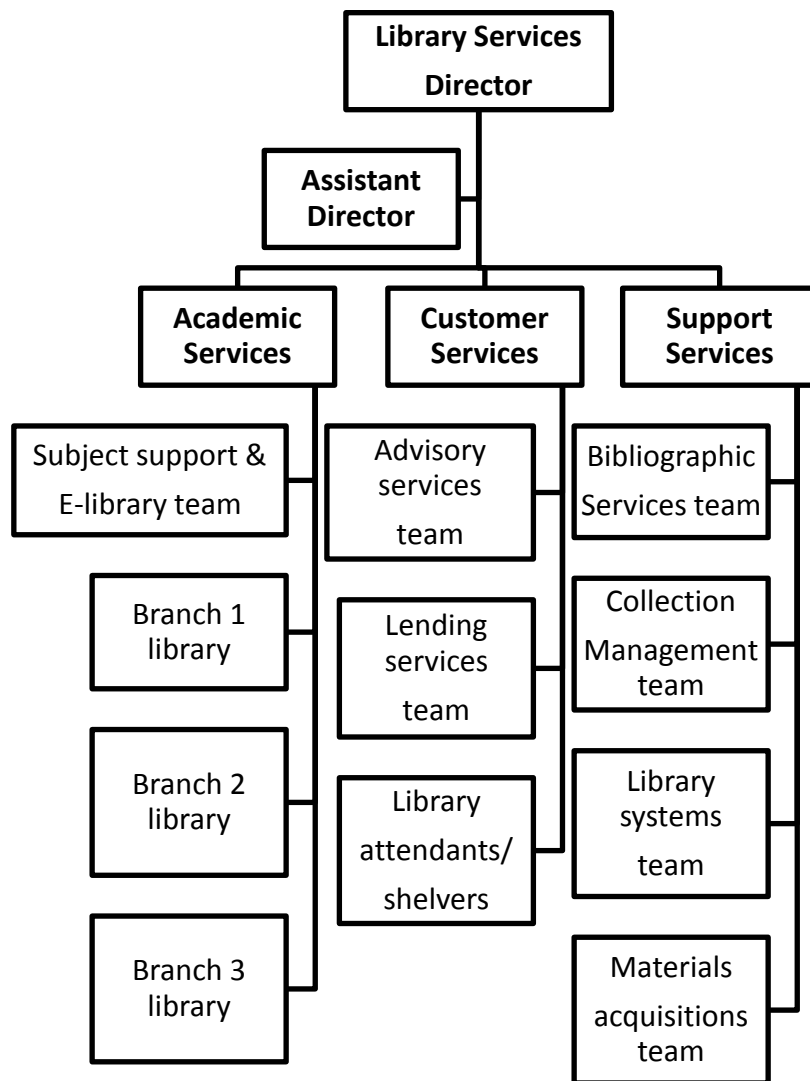


**Figure 4.2 Organisational structure for JO2**

#### **4.4 Case three (UK1)**

The third case selected for this research is a university library in the UK (UK1). This university started in 1872 on a very small scale, but it was not until the 1960s that the university started properly on a campus. It then expanded to include another campus. This is a town university that offers a variety of courses that fall under three main faculties: Arts and Humanities, Social sciences and Sciences. It offers undergraduate and postgraduate degrees in all specialities. The number of students is around 8,000. The university's mission is to continue to be internationally competitive in research and teaching.

In the UK, the term Information Services is usually used to represent the library and all IT services for academic purposes. It oversees the provision of library services for research and teaching. Although this university has a main library and several branch libraries, the code "UK1" will refer to all libraries as one, as processes are centralized. The diverse collection it embraces includes books, journals, theses, statistical publications and more. There are around 120 members of staff in total, taking all branch libraries into consideration. The following figure represents the organisational structure of the library:

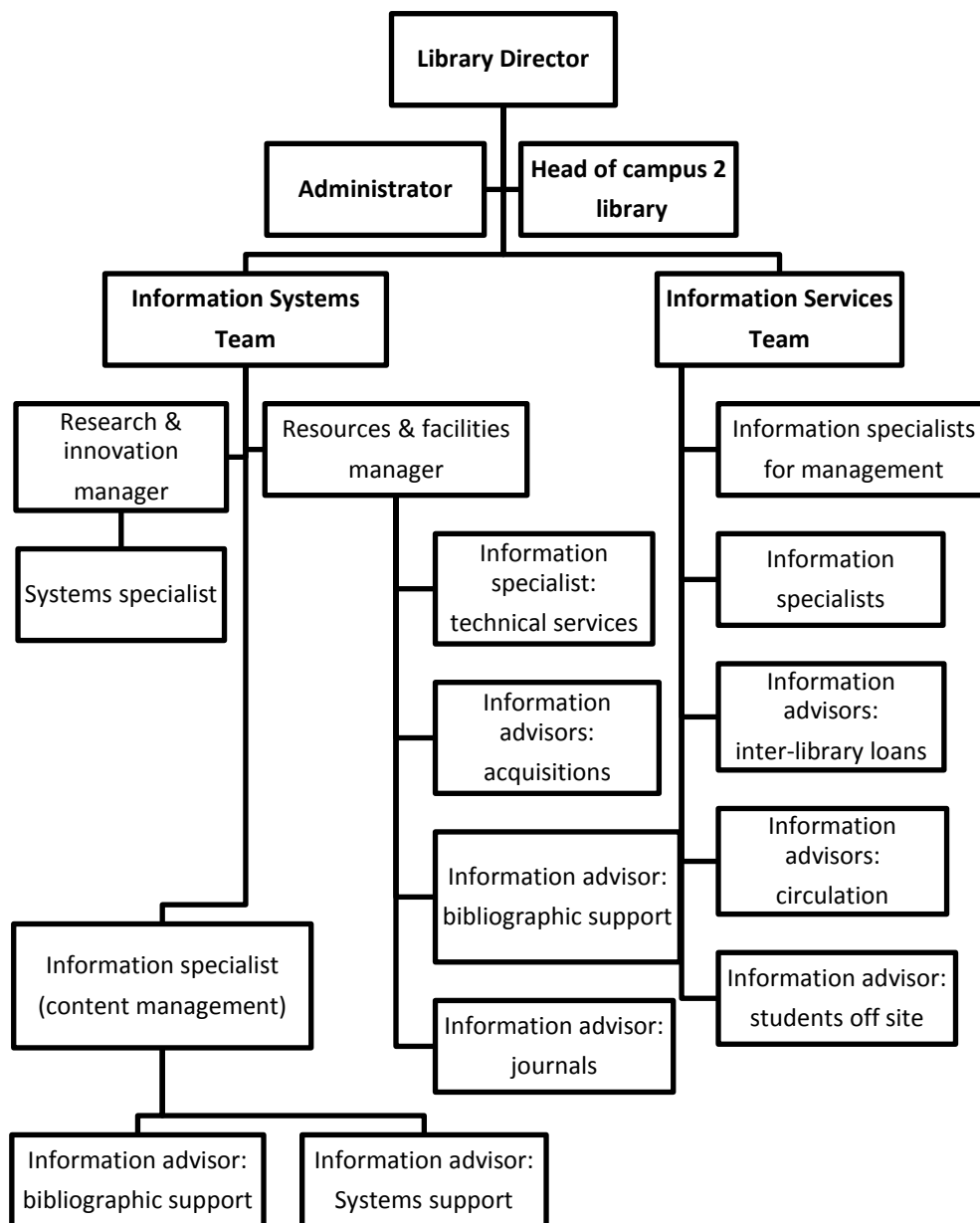


**Figure 4.3 Organisational structure for UK1**

#### **4.5 Case four (UK2)**

The fourth case is another university library in the UK (UK2). This university has a global reputation in research. It has five schools which bring a range of multidisciplinary skills in specialized fields such as: bioscience, aerospace, management, manufacturing and more. It has a small number of students, around 3,000, however, it is worth mentioning that it offers only postgraduate programmes. The university has two campuses, the main library is located on the main campus. As for the previous university library (UK1); the code (UK2)

will refer to all libraries as one. The library (UK2) has a collection of books, journals and reports. Thirty three members of staff work in the library. The main aim of the library and information services is to facilitate the research, teaching and learning by providing access to information resources and services. The following figure represents the organisational structure of the library:



**Figure 4.4 Organisational structure for UK2**

## 4.6 Cases comparison

The following table summarizes the information provided above for each university along with its selected library. This should illustrate general similarities and difference between the four cases. As some of the information was taken from the universities' websites, these cannot be referenced for reasons of anonymity. However, other information (such as size category) could be referenced.

	<b>JO1</b>	<b>JO2</b>	<b>UK1</b>	<b>UK2</b>
<b>University type</b>	public	private	public	public
<b>Number of students</b>	34,000	6,000	8,000	3,000
<b>University size</b>	big (compared to Jordan universities)	medium size (compared to Jordan universities)	medium size (compared to the UK universities and according to Urquhart et al., 2004)	small (compared to the UK universities and according to Urquhart et al., 2004)
<b>Old or new university?</b>	old (compared to Jordan universities)	new (compared to Jordan universities)	old (according to Urquhart et al., 2004)	old (according to Urquhart et al., 2004)
<b>University of Russell group?</b>	N/A	N/A	no (according to Russell Group, 2010)	no (according to Russell Group, 2010)
<b>Number of university campuses</b>	1	1	2	2
<b>Number of library titles (including books and journals)</b>	964,000	62,000	800,000	80,000
<b>Is library open to students, staff &amp;</b>	yes	yes	yes	yes



<b>researchers?</b>				
<b>Number of library staff</b>	88	20	around 120	33
<b>Collaboration involvement</b>	-member of public universities consortium. -theses deposit centre for Arab Universities -deposit centre for United Nations prints, IMF and WB brochures.	member of private universities consortium	-part of the Welsh repository network. -collaboration with Copac, the National Library of Wales, and the British Library public catalogue. -collaborates serial records to SUNCAT -PhD theses harvested from UK1 repository into the British Library EThOS service.	-collaborates serial records to SUNCAT - PhD theses harvested from UK1 repository into the British Library EThOS service. - contributes to DART Europe E-theses portal
<b>Sophistication of information systems</b>	JO1 has been introducing and implementing the principles of Total Quality Management (TQM)	Establishment of strategic five year plan for quality assurance	-It got involved in the e-learning benchmarking programme offered by HEA and used eMM. -UK1 is also enhancing various areas highlighted in the benchmarking exercise using Gwella	Benchmarking was applied in 2005 on e-learning Information Literacy tutorials

**Table 4.1 comparison of the four universities along with their libraries**

#### **4.6.1 University size and old vs. new**

Universities in Jordan are mainly and clearly classified into two types according to funding: public universities, and private universities. Public universities accept students with high grades, while private universities accept students with lower standards, but with higher fees. Jordan is a smaller country than the UK in size, and the establishment of universities there only started from the middle of the 20<sup>th</sup> century. It is to be expected that there is a limited number of universities (around 50), and therefore, it is easier to recognize similarities and differences. As a result, JO1 would be considered a large university, while JO2 is of a medium size.

It is more complicated in the UK. According to the JUSTEIS report, UK 1 university is of medium size, while UK2 university is small. The JUSTEIS project aimed to examine the use of electronic information services in higher education in the UK, so that trends in usage and evidence of specific needs contributed to the planning of JISC services (Urquhart et al., 2004). In this project, classification of universities according to size was illustrated as follows: a large university would hold more than 18,000 students, medium universities take a range of 6000 up to 18,000 students, while universities with a number of students less than 6000 are considered small.

New universities in the UK (according to Urquhart et al. (2004)) are usually the former polytechnics that became Universities in the 1990s, and previously known as Colleges of Higher Education – which have now attained university status. According to this classification, this makes both universities of UK1 and UK2 old universities.

#### **4.6.2 Russell grouping**

The category titled 'university of Russell group' refers to the UK universities, whether they are classified under this group or not. The Russell group is intended to embrace UK universities with an extent of focus on research activities; "Russell Group universities are committed to the highest levels of

academic excellence in both teaching and research. Our universities are to be found in all four nations and in every major city of the UK” (Russell Group, 2010).

According to the Consejo Superior de Investigaciones Científicas (CSIC, 2012), JO1 falls in the range of the top 50 universities within the Arab World. Although there is a Deanship of Academic Research in the University of JO1, research is not as intensive in Jordan as in the UK. However, JO1 attempts to satisfy the needs of researchers within and from outside the university by providing rich resources. In addition, the Deanship of Academic Research within the university is responsible for organizing, supervising, promoting and supporting academic research.

In both cases UK1 and UK 2 are university libraries that belong to the non-Russell group.

#### **4.6.3 Collaborative involvement**

Another aspect to look at is the extent of collaborative involvement. Regarding Jordanian university libraries, JO1 is a member of the public universities consortium, which enables students to search for materials on library catalogues of all public universities. In addition, JO1 is considered a deposit centre for many resources, as it is a deposit centre for the United Nations publications from 1970 onwards, a deposit centre for IMF (International Monetary Fund) and WB (World Bank) prints and brochures. It is also the deposit centre for theses from all over the Arab world, as universities from all over the Arab World send their theses to be held at JO1. Moreover, JO1 embraces archives such as newspapers, journals and magazines (dating back to 1870), government documents (dating back to the 16<sup>th</sup> century) and a collection of around 2500 manuscripts. Basically it is similar to a national library. Finally, JO1 values exchange of resources as it exchanges resources and prints with more than 300 Arabic and foreign research centres and scientific institutions.

JO2 is a member of private universities consortium, which allows students to search material from all private universities' catalogues.

For the UK universities, collaborative involvement applies in UK1 by its shared repository development (being part of the Welsh repository network), it also supports catalogue interoperability through its collaboration with COPAC which is a national, academic, and specialist library catalogue, and provides access to cataloguing records of academic libraries in major research universities in the UK and Ireland (Palmer, 2010). UK1 also collaborates with the National Library of Wales and the British Library public catalogue.

In addition, UK1 contributes serial records to SUNCAT (Serials Union Catalogue for the UK) which enables researchers and librarians to locate serials held in more than 50 largest universities and research libraries in the UK (Burnhill, Guy, and Osborne, 2006). SUNCAT contains information on both print and electronic serials such as journals and newspapers, resulting in a single comprehensive source of UK serials holding information. It is also a central source of quality bibliographic records, which enables contributing libraries to download records in MARC format to upgrade their local catalogues. Finally, UK1 has its PhD theses harvested from its institutional repository into the British Library EThOS (Electronic Theses Online Services). As listed in the British Library EThOS (n.d.), the aims of this service are:

- (1) To offer a single source of access where researchers can access all theses produced by the UK Higher Education
- (2) To support and encourage the UK higher institutions moving towards e-theses
- (3) To expand available content by digitizing paper theses
- (4) To attract research investment into the UK Higher Education and demonstrate the quality of UK research

Similarly, UK2 operates in collaboration with such catalogues. It contributes serial records to SUNCAT, it has its PhD records harvested from its own institutional repository into the British Library EThOS, and also, DART-Europe E-theses. The latter encourages the creation and use of European e-thesis

and maintains a central portal for e-thesis aggregation and access (Moyle, 2008).

#### **4.6.4 Sophistication of information systems**

In Jordan, JO1 has been introducing and implementing the principles of Total Quality Management. TQM is an approach that seeks to improve quality and performance to meet or exceed customers' expectations. It normally follows a seven-stage process as follows: (Anjard, 1998)

(1) Management – taking role in creating an environment that ensures TQM success.

(2) Visioning – developing a vision statement and quality decisions based on measurements

(3) Focusing on customers, identifying internal and external customers and their needs

(4) Team building and employees' involvement, and developing employees' ability to work together

(5) Facilitator training, as employees should receive continuous training on methods of quality

(6) Establishing a measurement regime, use of appropriate methodology and tools

(7) Establishing a review/improvement cycle – continuous work towards improvement

JO2, on the other hand, has established a concrete Quality Assurance foundation, based on a strategic five year plan (2007/2012). This process is composed of several phases aiming for continuous improvement, these phases include self-assessment and evaluation carried out by the university, followed by inspection undertaken by external specialized team in quality

assurance, finally, the Accreditation Office Council would study both evaluations and make recommendations, reports and decisions. Implementation of quality standards is a joint effort that has taken JO2 some steps forward, although challenges and difficulties were faced as big changes take time to implement. This process falls under the framework of the "Quality Assessment and Enhancement for Higher Education in Jordan" initiated by Al-Hussein Fund for Excellence (HFE).

The application of educational technology has been growing within UK universities, and many university library and information services have taken on roles in the management and development of learning technology. Given the importance for universities in demonstrating their commitment to e-learning or learning technology, and providing good learner support, it became necessary to have some sort of a management tool - benchmarking for e-learning capability, to judge how they are compared against other universities (in line with the growth of league tables for many aspects of university activities). Benchmarking e-learning in universities started to develop in earnest since 2005, when it was applied in New Zealand Tertiary institutions to determine their e-learning capabilities (Marshall, 2005). According to this study, capability in this context is the ability of the academic institution to ensure that e-learning design, development and deployment meet the needs of the institution and its stakeholders.

As part of a pilot project (initial prototype), the Higher Education Academy (HEA) in the UK trialled a number of methodologies for benchmarking e-learning in 2006, for example, ELTI (Embedding Learning Technologies Institutionally) was trialled by University of Bristol, University of Hertfordshire and University of Wales Institute. The eMM (E-Learning Maturity Model) was trialled by University of Manchester, and MIT90s (Management in The 90s) was trialled by University of Strathclyde (HEA, 2010).

In 2007, the HEA invited interested universities to become involved in the e-learning Benchmarking programme, second phase. The University of UK1 was one of those successfully admitted. The Benchmarking exercise took place between May and December 2007 and the academy provided

consultants for support. The exercise required information services at UK1 to take a comprehensive look at the role of e-learning in the university's planning and strategic processes ([UK1] Information Services, 2007).

The benchmarking standard followed in the exercise was the e-Learning Maturity Model (eMM), which is an internationally-recognized benchmarking and quality improvement framework based on the ideas of the Capability Maturity Model and SPICE (Software Process Improvement and Capability dEtermination) methodologies (Marshall, Mitchell and Beams, 2007).

Institutions can use eMM to assess and compare their capability to sustainably develop and support e-learning. Marshall, Mitchell and Beams (2007) state: "The ability of an institution to be effective in a particular area of work is dependent on their capability to engage in high quality processes that are reproducible". The eMM supplements the CMM concept of maturity levels, which describe the evolution of the organisation as a whole, with the following dimensions:

1. Delivery
2. Planning
3. Definition
4. Management
5. Optimization

In relation to that, the University of UK1 is taking part in a national project across Wales called Gwella, which means "to improve". The project started in March 2008. The universities involved had to engage with the HEA's e-learning Benchmarking programme to be able to gain funding. The University of UK1 carried out benchmarking in 2007 (as illustrated in the previous paragraph), and is enhancing various areas highlighted in the benchmarking exercise using Gwella.

For achieving enhancement, the Information Services E-learning Support team at UK1 maintains a good practice website for encouraging effective use of technology to enhance teaching and learning, which is directed at staff within the university, and also directed from and to other institutions to bring

guidelines on good practice and benefit to and from them. Regular surveys are one of the methods used to monitor impact and benefits, and determine the need for services in areas such as technology-enhanced learning and student experience.

For UK2, benchmarking was applied in 2005 for e-learning Information Literacy tutorials (Hunn, Elliott and Town, 2005). The benchmarking exercise was conducted on 10 online information literacy tutorials from different English speaking countries. Although there was a higher number of 30 tutorials selected at the beginning for review, only 10 were selected eventually for benchmarking process. Those 10 had common criteria, such as: covering similar subjects; being well known or well used; and following the SCONUL Seven Pillar Model (which was described in section 2.2.1).

The aim of the benchmarking exercise was to establish best practice and learn from others to provide the best quality and performance of information literacy tutorials. The method adopted for this exercise is derived from SCONUL benchmarking manual (Hart, 2001), which consists of three phases: planning, comparing and acting. Planning involved identifying institutions or 'partners' who had developed leading information literacy tutorial products along with selecting a measurement framework. Action, however, would be applying the best practice to the subsequent development of the proposed information literacy tutorial, and finally, comparisons influenced the creation of UK2's products for e-learning information literacy. These phases were described in the report of the LIRG (Library and Information Research Group) seminar (Hart, 2001), where the author presented practical examples of how academic libraries have evaluated and improved their services using benchmarking.

The exercise was successful in gaining valuable developer-based insight, and the output was used as an input at UK2 to their user requirements for the tutorial design. It also added some benefit to the relationship between librarians and the technical developers as it raised awareness of some technical problems.



## **4.7 Chapter four summary**

This chapter introduced the structure of each library selected in this research, illustrating hierarchies. It also provided an overview of the universities to which these libraries belong. Table 4.1 compares the four selected cases and their associated universities according to a set of categories such as: university size and type; extent of research within the university; number of titles in the libraries; the level of collaborative involvement; and the sophistication of information systems. The main findings imply that all cases collaborate with other institutions (such as consortiums or national libraries) but on different levels. JO1 and UK1 seem to be the most active when it comes to collaboration involvement. Moreover, e-learning has become important for UK1 and UK2, while JO1 and JO2 are involved in other quality assurance activities. The comparison should help readers to build an impression about these libraries and how (mentally) to fit the various processes into their settings, later in the following chapters.

## 5 Chapter Five: Riva

### 5.1 *Introduction*

This chapter is divided into two distinct parts to introduce the Riva method used in this work to model library processes. The first part describes the first part of Riva method, which is developing the Process Architecture Diagram (PAD). The steps for creating the architecture are illustrated, and a general PAD for university library as an organisation is created. This diagram describes the overall chunking of the organisational activities into processes. The second part of this chapter describes the second part of Riva which is the Role Activity Diagram (RAD). RAD is used to model individual processes.

At the end of the chapter, an overview of the tool used to model processes is presented, and a summary of library processes in the four selected cases are listed in table 5.3. The summary acts as a basis for later modelling each process using RAD as shall be seen in the following chapters.

### 5.2 *Part One: Process Architecture Diagram (PAD)*

#### 5.2.1 **Background**

As one looks around in an organisation, say for example an academic library, it can be noticed that there are many processes dealing with different aspects of the organisation's life. Some of these processes are vital, some take long to run, while others end quickly or operate on a day to day basis. These processes together represent what the organisation does. Ould (2005) argues that a process is about people doing business, how they do it, how they think they do it and how they can make it better. A process is basically a set of activities that interact together to achieve a certain goal. For example, Sommerville (2001) defines a software process as a set of activities that has a goal of developing software. People in any organisation have responsibilities

(roles) that are carried out by actors, who are individuals or groups in the organisation.

It is essential to divide organisational activities into processes, the right processes. This can be achieved by developing process architecture. Ould (2005) stresses the importance of constructing process architecture by stating that it is a concept of central importance for any work with processes. Some people might think about processes hierarchically or in a serial form, however a powerful process architecture is totally derived from an understanding of the organisation's business.

There have been various process architectures introduced in the literature, and we have to be careful about the way the term process is used, or rather over-used. Beer (1981) proposed the Viable System Model, which is also referred to as the whole system theory. He was inspired by the way human brain organises the operations of the muscles and internal organs. The theory comprises three main parts: the operations which are the units that do the work; the meta-system which provides services to the operations units; and finally the environment related to the system. Looking from other perspectives, Kavakli and Loucopoulos (1999) consider the organisation's goals to be the centre of process architecture. Lunn, Sixsmith, Lindsay and Vaarama (2003) introduced a process architecture based on a logical grouping of events that is considered to be a vital element of a business.

As mentioned in section 2.5.2, Riva was the application of choice. It comprises two main parts: the Process Architecture Diagram (PAD) which refers to the overall chunking of all the organisation's activities into processes, and the Role Activity Diagram (RAD) which provides a representation of each process within the organisation. Ould (2005) states that "Riva process architecture is an invariant for an organisation that stays in the same business". This makes it a secure place to start any process design or improvement activity. In a study conducted by Green and Ould (2004), Riva was successfully used to create a process architecture diagram for the programme administration part of the CEMS faculty in University of the West

of England. The stakeholders in the study found that the architecture was understood and straightforward to enact.

It is worth mentioning that this approach is analytical and looks at the organisation from a mechanistic point of view. Morgan (1997) believes that the mechanical way of thinking is deeply ingrained in day to day conception of organisation. He claims that organisations and processes can be defined in terms of metaphors, and examples of such metaphors are the use of 'machines', 'culture', 'organisms', and 'transformation'. Morgan (1997) believes that an associated challenge is "to find appropriate ways of seeing, understanding, and shaping the situations with which they have to deal." The PAD used in this research is an attempt to understand how the organisation (library) sees itself in relation to its environment, and for others to judge how its 'nervous system' operates.

### **5.2.2 Building the PAD**

This particular kind of process architecture proposed within the Riva approach is based upon key entities in an organisation. An Essential Business Entity (EBE) can be physical or concrete, such as a customer or a clinical trial. Those entities are part of the essence of the business and they are things one cannot get away from.

Before going ahead with identifying the business entities as a preparation for building the diagram, it is worth emphasising that the list of EBEs developed here are going to be generic, applicable as far as possible to the "typical academic library and information service". The process architecture should be at a high enough level of abstraction to allow for some variation in the priorities that individual services might wish to emphasise – but the aim was to provide a PAD that could represent "what academic libraries are about", with emphasis on a general diagram that would embrace all four case studies.

As mentioned before in section 3.6.1, the four cases were chosen to reflect different academic libraries and information services, and they have varying

priorities. For example, the fourth case (UK2) is targeted on research students, therefore, it is expected that it will focus on some EBEs more than others, and the same differences in emphasis applied to the others. For example, JO1 considers “binding” a priority process (which will be explained in more detail in chapter 8). As a result, to be able to get a proper discussion, it is better to fit all possible – mostly common - EBEs gathered from all four university libraries into one picture. The main aim will be to characterize the business that academic libraries are in, and to capture the network of concurrent activity in the organisation by providing a high level of abstraction. This broad comprehensive picture should encourage librarians to look deeper into processes, and suggest some pruning if needed.

The following steps (one to five) are the key stages for building process architecture as proposed by Ould (2005):

#### **5.2.2.1 Step One**

Finding the organisation’s EBEs. At this brainstorming stage, a long list of entity candidates can be produced. For this specific research, a general list of entities for university library as an organisation was produced based on some questions suggested by Ould (2005), as these questions help identify business entities:

- What do we make?

Classified catalogues of holdings, subject guides to electronic resources, repositories, access tools, alerting tools.

- What do we sell?

Access to media/document management services (printing, binding, photocopying services), software/hardware.

- What product lines do we have?

Digital library, digital repository, digital repository branding and marketing, publications, resource sharing and re-use (Web 2.0), learning resources, VLE.

- What services do we offer?

User assistance (tutorials, online guides), teaching programmes, lending services, reading facilities and learning spaces, digitization of resources for learning collections, conservation, acquisitions of resources, access to licensed / purchased resources and serving multiple constituencies, help desk and reference and enquiry services, accessibility support for students and staff with disabilities, information literacy support for students and staff, supporting knowledge transfer to external clients.

- What service lines do we have?

Type of assistance offered, types of library management system used, collection management policy, levels of access to resources (guest, student, staff, alumni), types of support for students and staff with disabilities, types of programmes for information skills training, types of programmes for VLE support (for staff), types of policies on digitization, types of policies on access to and use of purchased licensed resources.

- What things can we simply not get away from?

Data protection, copy rights and intellectual property, equality / diversity legislation, health and safety issues on work spaces, licensing agreements with publishers / aggregators, budgeting and financial issues such as currency value, publishers, suppliers, donations, quality standards and league tables, lifecycle of documents, and requirements for storage, standards for inter-operability, cataloguing standards.

- Who are our external customers?

Users of repository items (wider research community), users of library catalogue (including other libraries), users in local community, visitors to the library (visiting scholars, visiting students, etc...).

- Who are our internal customers?

Students and staff within the university, university researchers.

- Are there things that our customers have, or want, or do, that might be EBEs for us?

User accounts, loans of resources, complaints, library cards, list of requests, computer or equipment purchase, thesis, publication.

- What things do we think differentiate our organisation from others in the same business?

This can be applied particularly for the fourth case in this research (UK2), as it is generally considered to be different and innovative in service design. The library serves postgraduate researchers, and this means that they have different priorities to academic information services that host a learning management system for undergraduates, for example. The mission of the library should reflect how the university positions itself as a brand – with more emphasis on support of research, or services for the community, or services for students with special learning needs, for example.

- What sorts of things do we deal with day in, day out?

Lists of requests, purchases, loans, overdue notices, enquiries, journal access problems, computer network problems, invoices, maintenance and organisation of physical building space

(including re-shelving, rooms booking), maintenance of virtual library space, cataloguing and classification.

- What events in the 'outside world', the world outside our organisation, do we need to respond to?

The financial situation, changes in the student funding model, changes in research funding, changes in research assessment exercises, power failures. (And for the cases in the study: theses from other organisations for case JO1, consortium centre work for cases JO1 and JO2.)

- What business entities are listed in our corporate data model?

Student, staff, research activity, modules, programmes / courses.

- What things do our information systems keep information on?

Statistics regarding number of items, access to electronic resources, budget division, list of suppliers, borrowers, room booking, use of VLEs.

#### **5.2.2.2 Step Two**

Filtering the above entities is essential to remove the ones that are not considered the subject matter for the organisation. The second step in building process architecture diagram is to identify the EBEs that have a life time that the organisation must handle; these are called units of work (UOW). Units of work can be solid such as a building, or less tangible like a customer order. They can also be abstract and have a long duration such as a project, or very abstract such as changes to a purchase order. The list below is the first list of units of work, followed by a more refined list which was used in the general UOW diagram in the next step:



The first draft of units of work: Library, provisional catalogue records, full item record, classified catalogues of holdings, item (title), links to electronic resources, print collection, licence, acquisitions, repositories, digitization, conservation, resources access, help desk, collection management policy, publishers' demonstration, suppliers, processing, donations, staff and students from other universities, researchers from outside the university, teaching programmes, staff within the university, university researchers, list of requests, thesis, publication, purchases, loans, overdue notices, invoices, theses from other organisations and binding for case JO1, consortium, annual journal review, budget report.

The first draft was based on the things of importance mentioned in the interviews, and some general reading about management of academic libraries.

The principle is to include everything that might be of importance in the first draft, and then test out each item, to see whether it classes as an entity, according to advice by Ould (2005, p.175). For example, putting "a" or "the" in front of digitization does not make much sense, but "a catalogue record" is meaningful. Therefore we keep catalogue record as an entity that represents the "essence of the business" but digitization is retained in a separate list. It probably is important but we need to think more carefully about what it means.

The refined list of units of work to be used in the UOW diagram: Library, provisional catalogue records, full item record, classified catalogues of holdings, item (title), links to electronic resources, print collection, licence, acquisitions, digitization/digitized item, conservation/conservation policy/, collection management policy, publishers' demonstration, suppliers, processing, donations, teaching programmes, list of requests, invoices, annual journal reviews.

The thinking behind these choices is:

*Library:* as a physical space, this area needs to be looked after. We might need to think more about how we use the physical space and the virtual space. It is possible that the library as a physical space is part of the university

estate, and in fact it is a UOW for the Estates Department, but not for the Library itself. However, the Library may function as a learning space, and libraries may offer facilities for booking study carrels, or seminar rooms. For this research, such aspects are not the focus, but for the PAD we need to remember that the idea of learning space (physical) or research space (mostly supporting virtual collaborative working) could be important and would appear on the PAD.

*Provisional catalogue record:* this needs to be looked after as it is the working record of what has been ordered, or obtained. Until the item is obtained it may not be possible to provide any more details but it is a distinct UOW.

*Full item record:* it is a unit of work since we care about how it is designed (created). Ould suggests (Ould, 2005, p.178) that one method of finding unseen UOWs is to put the word “change” in front of each candidate UOW. Here “change to provisional catalogue record” to “create full record” definitely becomes a new UOW.

*Classified catalogues of holdings:* without it we are not in the essence of the business. These units of work are used constantly to search for items. Note that special collections may have their own catalogues – and archival collections will be processed in a different way to the rest of the book and journal collections. Ould (2005, p.178) also suggests that putting “collection of” in front of candidate UOWs can help to check whether there are other UOWs. In this case, the collection of catalogue items becomes something that has its own existence and something that differentiates one academic library from another.

*Item (title):* a title, whether it is a book or periodical, it needs to be looked after during its life time, from the moment it arrives to the library till it is placed on the shelves, and then removed when no longer required.

*Links to electronic resources and print collections:* these also represent units of work and need to be looked after during their life time, print collections need to be preserved and managed, subscriptions to electronic resources however

need to be renewed or stopped. Providing links to resources is an essential part of the business of the library.

*Licence*: it certainly has a life time and it needs to be looked after. There are all sorts of license agreements that adhere to certain rules and regulations, they need to be studied carefully during their life time and could be renewed or terminated.

*Acquisitions*: material acquisition starts, proceeds and stops, and we must look at this life time. A requested book or any library item is searched, ordered, catalogued, classified, labelled and placed on shelves, and we must look after all that.

*Digitization/digitized item*: digitized item is a unit of work as it goes through phases to become a digitized item. These stages must be looked after.

*Conservation/conservation policy and collection management policy*: these are units of work because not only do they feature as controls in the library, but also they are subject matter for the library. The library would decide on possible policies, approve distribute and make changes to them.

*Publishers' demonstration*: this classes as a UOW, as it must be organised, it forms an essential part of the acquisitions process for some libraries to help in making decisions about which resources to purchase.

*Suppliers*: although roles are not necessarily considered units of work, however, this role (suppliers) needs to be looked after since the business (the library) cannot operate effectively without it. This role needs to be looked after so that the library is able to decide on the best supplier to deal with.

*Processing*: we look after processing as a unit of work from the moment a book is labelled stamped and spine labelled. It is possible that some of the processing can be done prior to arrival in acquisitions, but most academic libraries will deal with processing themselves. For example, security bar codes need to be linked to the catalogue record for the item.

*Donations:* these are units of work that have a life time to handle. Donations are either accepted or rejected, if they are accepted they get catalogued, classified, processed and placed on the shelves. These need to be looked after.

*Teaching programmes:* the exact way teaching programmes will be instantiated depends on the institution and the way the library liaises with academic staff. For example, some libraries have a network of subject librarians who keep contact with faculties. Other libraries will be operating at the module level on a virtual learning environment, working with academic staff to ensure that students are directed to appropriate resources and have the support to use these effectively.

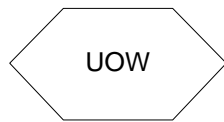
*List of requests:* these are units of work that need to be handled and looked after. This starts from the moment they are received until a decision is made about them, either order or reject them.

*Invoices:* Ould (2005, p.175) suggests that invoices can often be viewed as 'designed entities' and that invoices are not part of the business of the organisation. However, library invoices are a little different from the business of obtaining regular supplies from a number of suppliers. Subscription payments, for example, may come less frequently, but require large sums of money. Perhaps "budget" might be a better description of the EBE for the library, but invoice works for the examples discussed in detail in the thesis.

*Annual journal review:* this is a unit of work since it has a clear life time. It starts at specified time of the academic year, where budgets, current and new journal titles are discussed based on usage statistics. A decision is then made about the list of titles to purchase, negotiations with academics can take place here, then a final list of what to renew/cancel is produced. So these phases within the entity's life time need to be looked after.

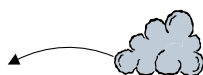
### 5.2.2.3 Step Three

Create a UOW diagram that examines the relationships between the units of work. UOWs are represented in the diagram using the following symbol:



**Figure 5.1 Unit of work symbol**

It is important to concentrate on the dynamic relationships between processes, thus, the diagram should demonstrate only the dynamic relationships between UOWs. Some relationships arise when a certain unit of work needs another, for example, 'cataloguing' needs an 'item'; one can't carry out 'cataloguing' unless they have an 'item' to apply 'cataloguing' on. This kind of relationship is demonstrated using the neutral word "generates", and it's represented in the diagram using a labelled arrow from the generating UOW to the generated UOW. In the case we have a UOW generated by an agent outside the organisation, the arrow in this case comes from a "cloud" symbol suggesting it's from the outside world.



**Figure 5.2 "cloud" symbol in the UOW diagram to represent agents outside the organisation, along with an arrow for a relationship**

The following diagram (figure 5.3) represents the UOW diagram. It is composed of the essential units of work within the library along with their dynamic relationships:



General notes on the above diagram:

- The top of the diagram looks at journals subscriptions, where 'subscription list' generates e-resources and print journals.
- Collection management policy monitors the annual journal review which is applied on both print and electronic journals. Please refer to section 6.6 for details about conducting an annual journal review.
- The 'item (title)' UOW represents the new non-periodical purchased title that the acquisitions generated. License agreements are involved here.
- In the acquisitions process, a book will be requested by academics for a teaching programme, so academics will generate a list, a list will generate acquisitions, then acquisitions will generate purchase, hence, new title. This new title need to be catalogued so it generates cataloguing process. The acquisitions process involves choosing suppliers and producing invoices.
- Note that there is a difference between a basic item record (done by acquisitions at the beginning) and a full item record done by the cataloguer).
- The cataloguing process generates "processing"; which is a term quoted directly from library staff interviewed. They used the term "processing" in the interviews to refer to the process of adding the spine label, the barcode, the ownership stamps/labels and security triggers to the item. As a term it may look a bit odd on the diagram, but it is difficult to think of another term to describe this – processing sequence or preparation or stock processing might be a possibility. For some libraries, and some role activity diagrams, it might be necessary to unpack processing a bit more, but for the role activity diagrams under investigation here, processing as a general term encompassing a set of activities is probably the best description in the circumstances.
- When a set of new print books (collection) is ready, it certainly needs to be managed and conserved.

- Two parties are considered for initiating items' acquisitions: academic staff and the library itself; sometimes the library would suggest certain items to buy, they might ask for some material to help and support library staff in their work, (although this doesn't happen in UK1 anymore as they barely manage to cover the requested lists).
- 'Supplier demonstration' unit of work expresses those publishers/vendors who come over to universities to advertise for their resources. It can also be referred to as "marketing". It is a kind of sales pitch and that might be the publisher, or a vendor who bundles different publisher journals together.
- Binding books is a process undertaken in JO1 only. Please refer to section 8.2 for detailed information about this process. According to information received from UK libraries however, binding doesn't exist as such. In UK1 for example, the Library Resource Manager states: "We only bind issues of journals but that is becoming increasingly rare due to budget constraints and the shift from paper journals to electronic journals". Therefore, binding was not illustrated in the diagram as the PAD is meant to be generic rather than detailed.
- Just like "binding", there are some processes that take place only in one case of the selected four, for example, in Jordan, there is this service of depositing theses from all over the Arab World into one library. In addition, as mentioned earlier, binding does not exist as a process except for in JO1. As a result, no such processes were included in this diagram as they are particularly specific to one case, in other words, the diagram is kept at a high level of abstraction because the main focus of this research is upon RADs and their application as analysis and improvements tools within academic libraries.
- Digitization and donations aren't common in all cases. Although they are listed as units of work in the diagram, there is no emphasis on the processes' details.
- Finally, there are three bubbles in the diagram, which represent outsiders to the organisation. For instance, a bubble is linked to a 'teaching programme' as it is expected to have students and academic



staff involved. 'Digitization' is also linked to a bubble as materials to be digitized could be received from academics outside the organisation. A third bubble is linked to 'donation' for those parties who donate materials to the library.

It is worth mentioning that figure 5.3 is the last version of six UOW diagrams that were created as drafts. At this stage and before moving any further, the work done in attempt to build a PAD was run past the Library Support Services Manager in UK1, to make sure that the right units of work had been captured. The reason is that steps four and five of building a PAD depend on having the right collection of UOWs. The manager's comments were very helpful, and included the following points which were considered in figure 5.3:

- Removing one essential business entity. 'Inter library loan' was included as an EBE in the second category of the first step of building a PAD, which is in the question stating: "what do we sell". The manager's comment on that was: "I don't think ILL should be included and with electronic delivery it is possible to bypass the library completely". Based on this comment, ILL was removed from that list.
- The unit of work 'annual journal review' was illustrated in the diagram with a relationship - being generated from - the unit of work 'link/e-resources'. However, the Library Resource Manager suggested adding the unit of work 'print collection' to also generate the 'annual journal review' as this review includes both print and electronic journals.
- 'Donations' as a unit of work was illustrated in the diagram in a relationship with 'acquisitions', that is, 'donations' generates 'acquisitions'. However, the comment was that donations bypass acquisitions and go straight to cataloguing.

#### **5.2.2.4 Step Four**

The next step is to hypothesise that each UOW has a case process which deals with a single instance of the UOW, a case management process that

deals with the flow of instances, and a case strategy process that determines the future strategy for the case and case management processes (Green and Ould, 2004).

To explain a case process (CP) and a case management process (CMP) more fully, Ould (2005) suggests that one should look at work done within an organisation as 'cases' or 'episodes'. In academic libraries for example, it is expected that an ordered item (a case) follows the same standard, in other words, a certain process deals with the case and handles it. This process is called 'case process' which is usually triggered when the case arrives. Ould (2005) defines a case process in a nice way by stating: "the process which takes a single case from 'birth' to 'death'." Case processes are named using the word 'handle' or 'prepare'.

Case management processes however are responsible for the flow of case processes instances. The decision of when an instance shall start is up to the CMP. It might also set priorities between different cases. According to Ould (2005), CMPs are named with the start of the words: "manage the flow of..."

There is a third process type called 'case strategy process'. This is concerned with driving the CPs and CMPs according to the strategic view of UOWs (Ould, 2005). This means that CSPs take long term view of what is happening and therefore, they might cause changes in CPs and CMPs. Examples of such processes in this research includes:

- Changes in the nature of some of the UOWs such as the 'annual journal review' or the 'collection management policy', where budgets are prone to change every year. There is also the change in the license agreements and suppliers' offers.
- Changes in the volume of some of the UOWs such as 'teaching programmes'; type of materials needed for teaching programmes might change.
- The effect of some factors on UOWs, for example, some academic departments demand more journal subscriptions, which affects the number of titles. The increase of materials' prices affect acquisitions.

To apply this hypothesis, the following case processes and case management processes were created. The selected processes are intended to cover the main UOWs:

<b>UOW</b>	<b>CP</b>	<b>CMP</b>
Subscription list	Handle a subscription list	
Print collection	Handle a print item	Manage the flow of print collection
e-resources	Handle an e-resource	Manage the flow of e-resources
Annual journal review	Prepare an annual journal review	
Collection management policy	Handle collection management policy	
Teaching programme	Handle teaching programme	Manage the flow of teaching programme
Order list	Handle an order list	Manage the flow of order lists
Acquisitions	Handle acquisitions	Manage the flow of acquisitions
Item	Handle an item	Manage the flow of items
Cataloguing	Handle cataloguing	
Supplier	Handle suppliers	Manage the flow of suppliers
Invoices	Handle invoices	Manage the flow of invoices

**Table 5.1 CPs and CMPs to be used in the PAD**

Note that “handling collection management policy” is the case strategy policy that maintains a strategic view of most of the units of work.

#### **5.2.2.5 Step Five**

The final stage is to convert the UOW diagram to a process architecture diagram, by turning the relationships between the units of work into relationships between corresponding case and case management processes.



### 5.2.3 Strengths and shortcomings of PAD

As illustrated in figure 5.4, a process architecture diagram for an academic library processes using Riva provides clear understanding of the core processes within the organisation through illustration of key entities. Beeson, Green and Kamm (2009) states that Riva modelling method provides a systematic way of transition from key business entities to process architecture diagram to the detailed design of roles and their interactions as will be seen later in the following chapter. This method can be used formally and informally as the diagrams produced are useful even without full completion or validation. According to Ould (2005), a process architecture diagram may be transferred or reused in another organisation in the same business type.

The PAD produced should help librarians think about library processes and how everything fits in the big picture. It should urge librarians to think about strategic planning. For example, in the diagram, there is a link between managing the flow of teaching programmes and the collection management policy. This implies that there should be structures in place for negotiation between library managers and those in charge of teaching and learning in the institution.

Although Riva provides unique invariant process architecture, it is not fully assured that all business entities are identified in step one. There is a need for heuristics and more rules to explore EBEs (Green and Ould, 2004). It is crucial to find a more definite set of entities so that transition to the process architecture is simpler.

According to Beeson, Green and Kamm (2009): “the claim that organisations in the same business will have the same process architecture is too strong and cannot be proved or disproved until it is made more precise what it means to be in the same business or have the same process architecture”. This debate applies in this research, where these four cases are considered to be ‘of the same business’, of being academic libraries, but not necessarily having the same detailed process architecture at a low abstraction level. Instead, one general PAD was provided at a high level of abstraction.

## **5.3 Part Two: Role Activity Diagram (RAD)**

### **5.3.1 Basic concepts**

In the literature review in chapter two, RAD was introduced briefly as one modelling technique to represent business processes. Examples of previous studies that applied the RAD - either to model processes or to compare different modelling methods - were also presented in chapter two, in section 2.5 specifically. In this chapter, the researcher shall look at the method more closely. Unlike the PAD illustrated in section 5.2.2, which provided a generic picture of processes within academic libraries, the Role Activity Diagrams presented in the following chapters are discussed in detail – low level of abstraction, as they are the main focus of this research. They are designed for each process individually, illustrating the same process for all the different cases. This shall provide a better understanding of how each library deals with its processes, hence, allow for comparisons and further possible improvements.

However, before presenting processes in RADs and discussing the models, definitions of some basic concepts and notations should be clarified, the following definitions are obtained from Ould's book (2005) and they are central to Riva:

A process: a coherent set of activities carried out by roles which collaborate together to achieve a goal. A process is about people doing business and how they do it. A process has goals and outcomes.

A role: a responsibility within a process. People do things in an organisation because they have responsibilities, these responsibilities or roles are carried out by actors, who can be either individuals or perhaps a group of people.

An actor: an individual or a group that carries out a role.

An action: these are the activities carried out by a role following certain business rules.

An interaction: way of communication between roles, roles have interactions to collaborate. Sometimes people in the organisation need to do work together, in other words, they need to collaborate, for example; sometimes an information specialist in an academic library needs to collaborate with an academic to decide on the book list to be ordered.






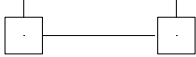



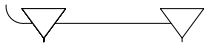



A goal or an outcome: the desired state of a process, each process exist for a goal, for example; the goal of material acquisitions process in an academic library is to order the required material and make it available in the library collection.

### **5.3.2 Modelling notations in Riva**

Coming to the notations used in RAD to represent the concepts above, each one has a symbol or a notation that represents it in the model. Ould (2005) asserts that there is no single right way of modelling a process, instead, a process model is right if it helps revealing things one wants to know. A process can be modelled from different perspectives as the modeller judges.

A process model in Riva is called RAD, it shows the roles participating in the process, along with their activities (or actions) and the interactions between these roles. The following table introduces the RAD notations, these are taken from Visio, which is the modelling tool used here (Microsoft Office, 2010). Please refer to section 5.4 for more information about this tool.



<b>RAD notation</b>	<b>Notation meaning</b>
	A role. Example: acquisitions team, or library director
	An action. Example: prepare presentation
	Start another role. Example: start new designer
	Driver part-interaction. Example: order book
	An interaction.
	Interaction between two roles. Example: negotiate price
	A state description. Example: order complete
	A state.
	A trigger. Example: start of academic year
	Case refinement: alternative paths depending on the condition. Example: budget exceeds 2000? Yes/No
	Part refinement: concurrent paths (to represent things done in parallel).
	Replication. Example: for each book
	Don't care what happens then.

**Table 5.2 RAD notations (Ould, 2005)**

## **5.4 Modelling tool (Visio)**

As mentioned previously, Visio is the tool used in this research to model processes. Visio Professional 2007 is a Microsoft Office product which helps IT and business professionals communicate. “Microsoft Office Visio 2007 makes it easy for IT and business professionals to visualize, explore, and communicate complex information”. (Microsoft Office, 2010) It provides a wide range of templates- business process models, workflow diagrams, that one can use to visualize and streamline business processes to better understand it, chart organisations, and track projects.

Visio is an appropriate tool to model processes; from which the notations in table 5.2 are quoted. “Visio is designed to be a top notch commercial drawing tool” (Godfrey, 2007). There are other tools that are used to prepare role activity diagrams, according to Ould (2005), they might use slightly different symbols, however, the meaning is what really matters.

IBM Rational Rose is one popular tool for UML diagrams (Godfrey, 2007). OmniGraffle on the other hand is one tool that supports creating flowcharts and diagrams, but it is only available for Macintosh, and the researcher was using Windows XP. (Crowley, 2006)

## **5.5 Summary of processes**

As mentioned in section 3.6.1, five processes were selected to be modelled in RAD. Following is a table summarizing these processes along with the number of RADs provided for them:

	JO1	JO2	UK1	UK2
<b>Books acquisitions</b>	<u>five RADs</u> - print books	<u>four RADs</u> - print books	<u>one RAD</u> for electronic & printed books	<u>one RAD</u> for electronic & printed books
<b>Periodicals acquisitions</b>	- print periodicals - a special case - e-resources initiated by faculties. - e-resources initiated by publishers.	- print periodicals - electronic resources - books donations	<u>one RAD</u> for electronic & printed periodicals	<u>one RAD</u> for electronic & printed periodicals
<b>Cat &amp; Class</b>	<u>one RAD</u>	<u>one RAD</u>	<u>one RAD</u>	<u>one RAD</u>
<b>Binding</b>	<u>one RAD</u>	<u>one RAD</u>	doesn't exist as a process	doesn't exist as a process
<b>Digitization</b>	started outsourcing projects	doesn't exist as a process	<u>two RADs</u> - digitization procedures - decision on whether to order it or digitize it in-house	doesn't exist as a process
<b>Thesis handling</b>	<u>two RADs</u> - theses submission by students - theses deposit by other universities	N/A	N/A	N/A

**Table 5.3 Summary of processes modelled for the selected libraries**

## **5.6 Chapter five summary**

This chapter introduced Riva and its components as a business process modelling method. PAD (which is the first part of Riva) was created to present the overall chunking of libraries' activities into processes. An introduction about RAD (the second part of Riva) and its notations was provided as a basis for the following chapters in which models of RADs will be provided to present processes.

Process architecture is a concept of central importance for any work with processes. A powerful one is totally derived from an understanding of the organisation's business (Ould, 2005). There have been various process architectures introduced in the literature, the one chosen for this research is of the analytical type, and looks at the organisation from a mechanistic point of view. The PAD used in this research is an attempt to understand how the organisation (library) sees itself in relation to its environment, and for others to judge how its 'nervous system' operates.

The four cases selected for this research reflect different academic libraries and information services, and they have varying priorities. As a result, the PAD was produced at a high level of abstraction to provide a broad comprehensive picture that is hoped to encourage librarians to look deeper into processes, and suggest some pruning if needed.

Chapters six, seven and eight will provide models of RADs representing the processes listed in table 5.3 in attempt to visualize, analyse and improve library processes. Visio 2007 is the drawing tool used to provide the notations that support the RAD.

## **6 Chapter Six: Acquisitions Processes**

### **6.1 Introduction**

This chapter discusses the processes for acquisition of materials in the four cases selected for this research. The chapter is divided into three main parts: the first one (section 6.2) discusses common aspects of acquisition processes, changes in acquisitions departments that have been taking place in academic libraries for the last ten years, and some ways to deal with, and manage collections. This helps to set the scene for understanding of the individual cases. The second part (sections 6.3 to 6.6) introduces periodical acquisition in RAD, while the third part (sections 6.8 to 6.11) represents non-periodical acquisition in RAD, which focuses on acquisition of books. Further analysis involved listening carefully to the interviews and identifying the detailed activities and roles involved in the process of material acquisitions, a RAD is provided for both processes for all university libraries selected, followed by analysis of the diagrams. Note that some roles might be similar in some libraries but the titles/names of those roles could be different. The names are used in the diagrams as they were provided by the interviewees.

### **6.2 Acquisitions and access to resources**

The acquisitions department in academic libraries is considered one of the most basic and important units within the library. It is nowadays mainly responsible for providing the library, and the academic organisation as a whole with resources such as books and journals. Books and periodicals; print or in electronic format, are considered a major source of exchanging information. According to Potter (1981), there were no centralized serials departments within libraries before 1930s, at least in American libraries (as cited in Bordeianu, Lewis and Wilkinson, 1998). Around that time, libraries started to establish separate serials departments. As the survey of the ARL

members in 1987 shows, 57% had separate monographic and serials acquisitions departments (Bordeianu et al., 1998).

Before 1990, books and journals used to arrive to libraries in their usual physical format. After the internet revolution however, the trend towards electronic resources, especially e-journals, started to replace or complement the physical resources, in other words, internet technology is moving academic libraries towards access rather than holdings. This major change has aroused challenges within academic libraries, challenges concerning managing those virtual items, their licensing and archiving (Kulp and Rupp-Serrano, 2005). Acquisitions departments within libraries – which are now often merged with the serials department – were the first to be exposed to changes as they act as the interface between the library and the marketplace (Bordeianu et al., 1998). As a result, during this period (the 1990s) a new mode of response to library environment appeared, for example, in 1996 a major restructuring occurred in the acquisitions department at the University Libraries of Norte Dame, Indiana, by implementing a library task force that examined serials-related operations, in addition to some functions' mergers as a solution to bottlenecks in operations.

Changes achieved in acquisitions can provide a solid base and a fertile ground for whatever changes to be undertaken within the library as a whole. (Gleason and Zeugner, 1998). For example, focusing efforts on acquisition of a wide range of electronic materials would fit the profile of an academic library intent on meeting the needs of biomedical researchers. Other academic libraries with special collections might focus on digitization and further acquisition of rare items.

The increasing complexity of managing library materials, especially periodical collections, demands a sophisticated collection management system, especially for managing access to electronic resources (e-resources). Although the format of resources has changed, the principles of material selection to meet user needs still apply (Corrall, 2012a). Such e-resources acquisitions can be a very complex process, "materials budget, acquisitions decision making, and workflow coordination all have important roles to play in

the process” (Kulp and Rupp-Serrano, 2005). The qualitative methods used in this research help understand and explore how libraries in this research address these areas and how budget and staffing affect the process.

Dorner (2004) conducted a survey in some libraries around the world to determine whether electronic resources have changed collection managers’ roles. Dorner states that “because of the impact of digital information, academic and research libraries can no longer operate effectively with traditional organisational structures”. Clearly, the electronic resources revolution, budget shortfalls and information expansion have affected academic libraries in various ways, most importantly, in their organisational structure. For example, in UK1; the third case chosen for this research, the ‘collection management’ team was newly established in 2004.

In another example, University of Wisconsin-Eau Claire formed the Committee On Journal Cancellations (COJC) in order to facilitate the cancellation process of some journals due to budget shortfalls. The mission of this committee is to analyse reports related to cost, use and the availability of online full text for each department, the committee shares usage statistics with the departments and asks them to rank their journals according to importance for cancellation (Carey, Elfstrand and Hjelte, 2005). This committee’s work is similar to the ‘annual journal review’ held every year in UK2, the fourth selected case in this research. These new positions and titles did not exist ten years ago, they were all inspired and developed as a result of radical changes to the working environment of academic libraries.

Change continues and academic libraries continue seeking better collection management systems. Bazin, Desmarais and Schuster (2006) discuss the increasing need for maintaining and managing periodicals collection through a collection management system. They used Microsoft Access to build the management system and to generate reports and statistics at Providence College. This system provided the librarians with information required to integrate periodicals collections, and also provided academics with information regarding periodicals which would help them decide on, or cancel specific titles.

A recurrent theme has been the need for academic libraries to provide access to more content cost-effectively. Library users have grown to expect instant access to information, and a diverse range of information. One way of supplying access to information required by an individual is inter-library loan, as academic libraries nowadays cannot possibly collect all materials that might conceivably be of interest to their users (Martimore, 2005). ILL is basically a service for requesting books and journal articles and other sources not held by one library, it is there to support staff, students and researchers to access more content. It has traditionally operated on a reactive basis, with users required to identify the material required and make the request.

A related study to using ILL data to develop prescient collections is the one conducted by Mortimore (2005). The study was conducted to address the problem of access versus ownership. The motive behind this study is to help academic libraries adjust their collection development policies to achieve better balance between access and ownership of resources at this time of increasing materials' cost and seemingly ever decreasing budgets. The adopted strategy is called Access-Informed Collection Development, the methods pertaining to it are: subject analysis which attempts to analyse the real use of a library's material within a specific area, and just-in-time acquisitions which uses ILL to make decisions about specific titles. Just-in-time acquisition (purchase on demand) represents a user-centered service for providing print material.

Carroll and Brink (2006) introduced Infotrieve service to supply articles on demand to University of Hampshire library users. As information needs are growing much faster than academic libraries' budgets, this method acts as a solution to the journal problem academic libraries are facing these days, by changing access from journals' subscriptions to document delivery. Infotrieve includes unlimited table of contents, and allows users to view article prices as they order them. This feature raised the awareness of information cost for users. The implementation of this service at University of Hampshire library led to a drop in new journal requests. It is worth mentioning that the authors of this article compared ILL service to Infotrieve in the mentioned university library. Although ILL does not charge a copyright fee as Infotrieve does, it



does not however offer the service 24/7 accompanied with a table of contents. The challenge raised from the implementation of such service is how to determine which service to use for document delivery: ILL or Infotrieve? The authors suggest that the optimal workflow would be to stream all requests to one librarian and allow them to advise the user where to get the title from.

Patron Driven Acquisition (PDA) is a purchasing model that allows users to access titles from NetLibrary which is a premier e-books and e-audiobooks provider. Purchases through this model are made automatically only when a specific title has been accessed. This ensures usage of each e-book the user really acquires. Like purchase on demand, PDA has been operating in collection management for at least ten years. In fact, sometimes purchase on demand is not very efficient as the cost of maintaining the material can be very high. In addition, one cannot ignore the convenience, and other features users might want from electronic versions (Chadwell, 2009). Schroeder (2012) states that the cost per use for PDA methods is lower than for traditional collection management methods.

Most PDA models work on the basis that the library purchases an e-book when the user accesses a title, it could be ten single views or one whole chapter view, or one cut and paste, this would convert the title to a library acquisition. This varies from one e-book supplier to another, for example, the PDA at EBSCO does not include an option for purchasing chapters of e-books, it just offers whole e-books. The senior director of sales, e-books and audiobooks at EBSCO states: "We have seen some interest in chapter-level licensing and expect to see more. At this time, there are no options to purchase at the chapter level" (Harris, 2011). Other suppliers such as Springer do offer chapter purchases, which makes sense given the downloading requirements. The e-product manager for e-books and databases at Springer states:

*Springer eBooks on Springerlink are available by chapter, or by reference work entry, because many researchers search for content that matches their search-query. The information they are looking for might be in only one chapter of an e-book (Harris, 2011).*

According to Estelle (2011), there are problems associated with PDA. From the library's perspective, there will be lack of control over budget, from the publisher's perspective however, books that get viewed rise in price to subsidize the ones that do not.

Again, money can be an obstacle, and in such times of economic downturn, it is likely that most academic libraries are going to be unable to make a separate funding stream available for PDA, and Chadwell (2009) suggests that collection managers should carve out funding for PDA from existing budgets to succeed in implementing this user-centered service. The academic Services Manager in UK1 said when interviewed in 2008 that there is a 25% increase in price from last year, she stated that: "there is no way you could gain this increase in budget". Similarly, Head of Information Systems in UK2 referred to budgeting as the main challenge facing their library.

Many collection managers in academic libraries have become aware of the concept of cost per use, which refers to the total cost of a resource (say a journal) divided by the number of times it is used. It is an indicator that can help collection managers take decisions about sustaining or cancelling resources. In 1997 a survey for Trent University library was conducted to explore the cost per use for bound and microform serials to identify candidates for cancellations. It was concluded that the calculation of cost per use is invaluable to librarians and faculty staff since a decision can be made about its effectiveness; "whether to maintain a serial subscription or whether an acceptable alternative such as document delivery is more economically efficient" (Scigliano, 2000).

In 2002, a case study was conducted on a university library to explore the impact of academic libraries' conversion to electronic journals on staff and costs. The results showed that electronic journals are more cost effective on a per use basis if all costs are considered for print versions, as storage space for low use print journals is a major cost (Montgomery and King, 2002). A similar study was undertaken in a US university library for the academic year 2007-2008, the study assessed a total of 488 titles for cost per use, of which

302 exceeded \$100 cost per use. The results initiated cancellation for some titles or format conversion for others (Lukes, 2008).

Library staff are not necessarily always happy with changes happening within libraries, as Lewis (2001) comments on user-driven acquisitions:

*User-driven purchase models, like NetLibrary's PDA model, passes the selection task to library users and, at least in some cases, can be markedly more effective than traditional selection. However, since models like these threaten to displace the traditional roles of librarians; it is likely that there will be resistance to this change.*

Siddiqui (2003) believes that library staff resist change when they feel threatened by it, they yearn for stability when they face too much change. This certainly creates a challenge for library managers.

The next section illustrates RADs for the periodical acquisitions process in the selected libraries. RAD has been discussed in the literature and has been applied to model various business processes, however, it is quite new to librarianship. Very little in the literature considers any modelling such as RAD within the library environment. As mentioned in section 2.5, RAD was applied within the academic environment to model a scientific publishing process for digital libraries (Khan, Odeh and McClatchey, 2006), and it has also been applied in another study to model a basic process of checking a book in the library (Liu et al., 1999). This chapter presents RAD as a modelling method to visualize library processes within academic libraries, more specifically, within four cases chosen for this research.

### **6.3 Periodical acquisitions in JO1**

Starting with the first Jordanian library, the Role Activity Diagrams shown next are presentations of periodical acquisitions process in JO1. According to the data collected from interviewed library staff and gathered documents, it was learnt that periodical acquisition process for print and electronic periodicals is different, and therefore, presented in different models. The process of print periodical acquisitions can be presented in one RAD while the process of

electronic periodical acquisitions is presented using two different models based on the party that initiates the process.

The participating roles in materials' acquisitions process in general as learnt from the interviews are:

**Provider/publisher:** refers to the party that provides the library with required material, it could be the publisher directly. Publishers come occasionally to the university to present their publications, or are represented by a supplier with whom there is an agreement to provide the library with books/journals. This role of information providers have been evolving. As will be seen in the following diagrams, the term that refers to the organisation/party that provides the library with journals and books varies. Some interviewees used the term "agent", some used "supplier", and others used "provider" or "publisher". To make things clear before carrying on with this work, it is essential to understand those terms, what they mean, how they differ and how their role has evolved in the last decade.

From the interviews conducted with library staff responsible for ordering books and journals, it was concluded that although sometimes acquisitions purchase some material online, still, normally, they tend to deal with a specific number of suppliers to make the requested material available for their users. Each library of the four cases selected deals with some suppliers such as EBSCO, SWETS and more. So what is the supplier's (or aggregator's) role? And how does it differ from the publisher's role?

Starting with publishers, anything that is printed and disseminated is a publication. A publisher could be a group or an organisation that is responsible for the production of a publication. Germano (2008) classifies publishers into five categories; trade publishers, textbook publishers - who provide academics with what they need for a specific course, scholarly or academic publishers, reference publishers, and self-publishing. With the technology and internet revolution, publishing in the electronic age is going through many changes in the way it has traditionally conducted its business since the fifteenth century. However, traditional publishers still exist and will stay around, and Germano (2008) suggest reasons for that such as the fact

that publishers can get books into places where readers can be found, such as classrooms and bookstores. Publishers select, which adds value to the work, the web is impermanent which means that anything can be changed or deleted.

Hogenaar (2009) describes changes in the publication and scholarly communication process, where communication is a broader concept than publishing. He describes the change from traditional publication to what is called collaboratories, where researchers collaborate and cooperate in distributed teams, and share tools and resources. An example of such collaboratory is Cx-Nets on complex networks. It supports collaboration between teams in the USA, France and Italy, who pursue the same research agenda in close collaboration. Hogenaar (2009) states that information within a collaboratory is not necessarily shared with everybody, and it is not primarily focused on open exchange of information.

The suppliers, however, or the information vendors are 'service companies', but their role has evolved in the past decade and their name too has been changed into 'information technology companies', as suggested by Dugan and Hernon (1999). Suppliers such as EBSCO for instance work with publishers on behalf of hundreds of libraries to help them manage their print serials subscriptions. Nowadays, suppliers are called aggregators as their role has expanded to include the creation of in-house, aggregate abstract and citation information databases, together with the inclusion of full text content. As a result, these companies have evolved to become more like content providers rather than just information intermediaries, which has made their role become very important. "These vendors have skilfully adapted current information technology to deliver better products by providing relevant information services and content to end users via the library" (Dugan and Hernon, 1999). Library services in turn have become more effective and efficient.

According to Madarash-Hill (2005): "electronic aggregator databases serve to aggregate or bring together electronic journal articles from different publishers all on the same interface, in addition to providing access to remote users".

Beckett (2002) stresses the importance of qualifying the term 'aggregator' when used, as there is the original packaging aggregator, whose role is to license the content from primary publisher, to convert it from paper to electronic format at no cost to the primary publisher, and to distribute, sell and market the resulting aggregation of content to libraries. The publisher receives a royalty share of income generated by sale. However, there are also the content/hosting aggregators, who are publisher-facing, and they get most of their revenue from providing publishers with services such as data conversion, hosting distribution, access control and linking services. Publishers pay them to build and maintain their electronic presence, the content aggregators do not handle the revenues associated with subscriptions, the publishers do. Finally, there are the gateway aggregators who index or categorize disparate content on other content host services (Moghaddam and Moballeghi, 2007).

**Consortium centre:** to carry on with the participating roles in the process of material acquisitions for JO1, the consortium centre is the secondary role. As this case study university library (JO1) is a public one, it is part of the public universities consortium in Jordan. The centre acts as a link between the library and any provider who wishes to offer a proposal.

**Library administration:** basically the authority in the library, and most decisions are approved from there.

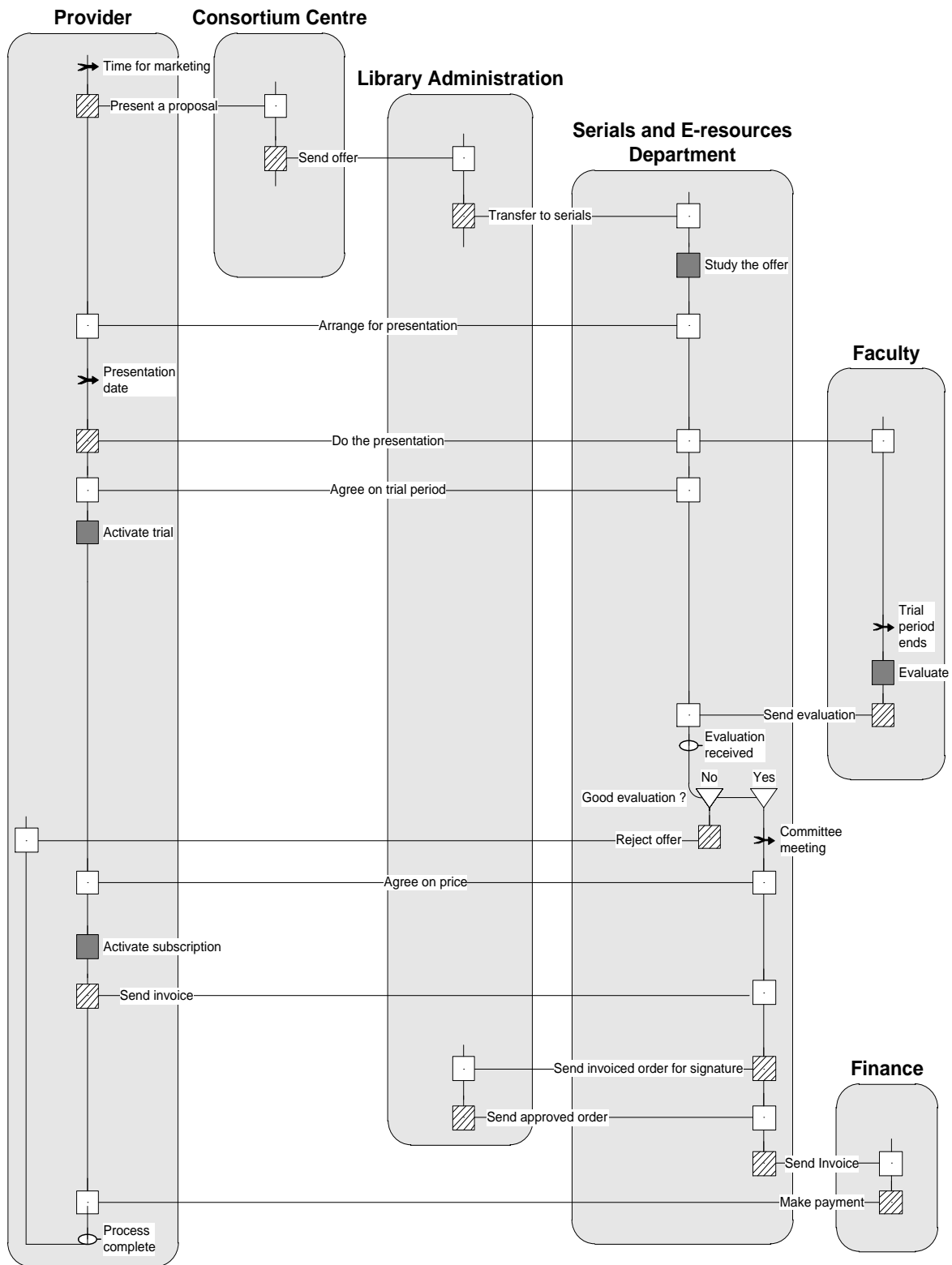
**Serials and e-resources department:** comprises eight members of staff including the head of division. Its main responsibility role is to provide the library with all sorts of periodicals such as newspapers, magazines and journals. This department deals with both print and electronic periodicals, but books are dealt with separately by the acquisitions team. This is an important difference between Jordanian academic libraries and British ones. As could be observed from the two Jordanian cases, acquisitions usually deal with books and other print library material while periodicals are dealt with by a separate department. However, in the UK cases, acquisition departments currently seem to deal with all library materials (in terms of ordering them).

**Faculty:** refers to any faculty in this university. There is a large number of faculties in this university, each embraces a number of departments that offer

various specialities, for example; the faculty of Information Technology includes three different departments each offering a speciality, the faculty of Education, however, has got five departments each offering more than one speciality. There is a faculty representative for each faculty, who liaises with the library.

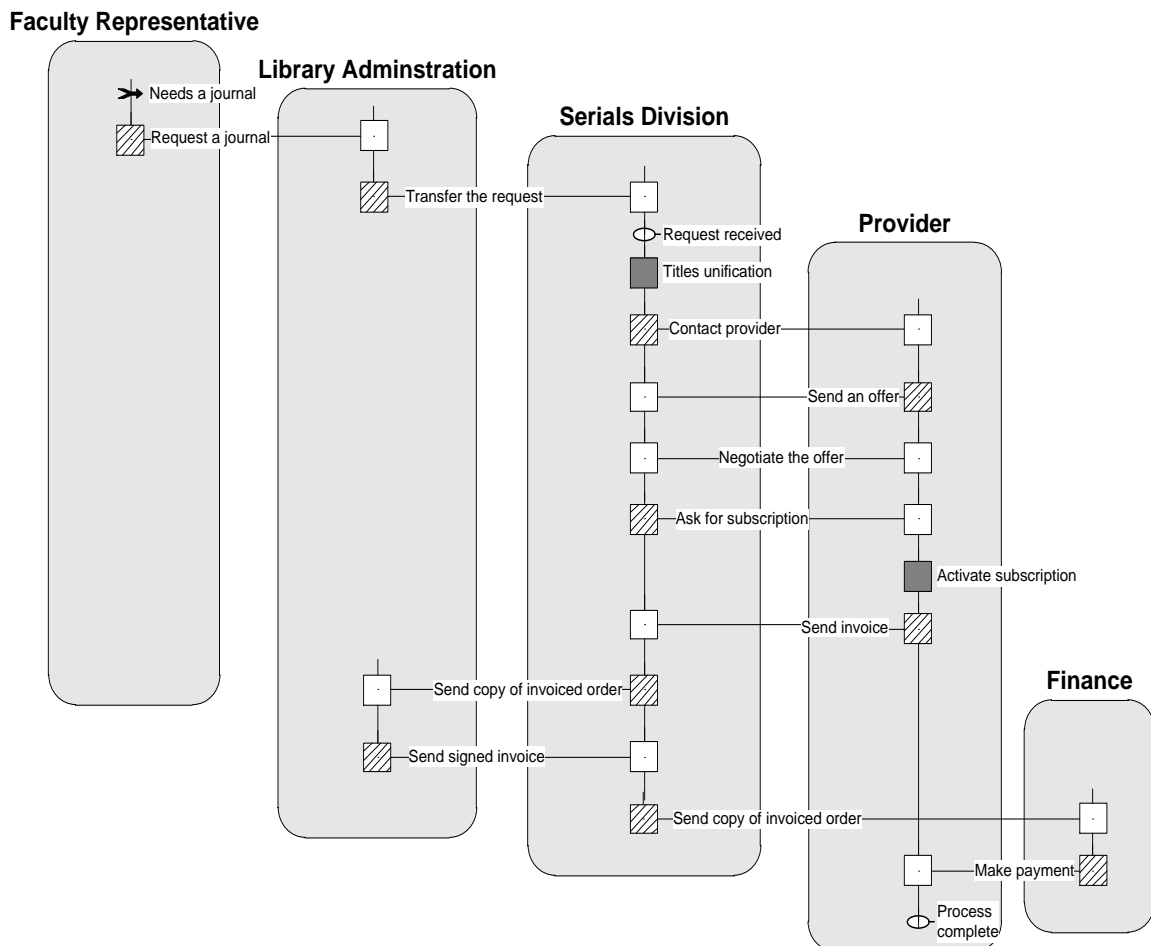
**Finance:** deals with the payments.

In JO1, the acquisitions department deals with orders of print books and other print materials (except periodicals). The Serials and e-resources department deals with ordering print periodicals, and their work also extends to include ordering all sorts of electronic resources, including, obviously, electronic periodicals. As it is only periodicals discussed in this section, the following three RADs look at periodical acquisitions in JO1, followed by brief description of each process.



**Figure 6.1 RAD for electronic resource acquisitions process in JO1, with the provider initiating the process**





**Figure 6.2 RAD for electronic resource acquisitions process in JO1, with the faculties initiating the process**

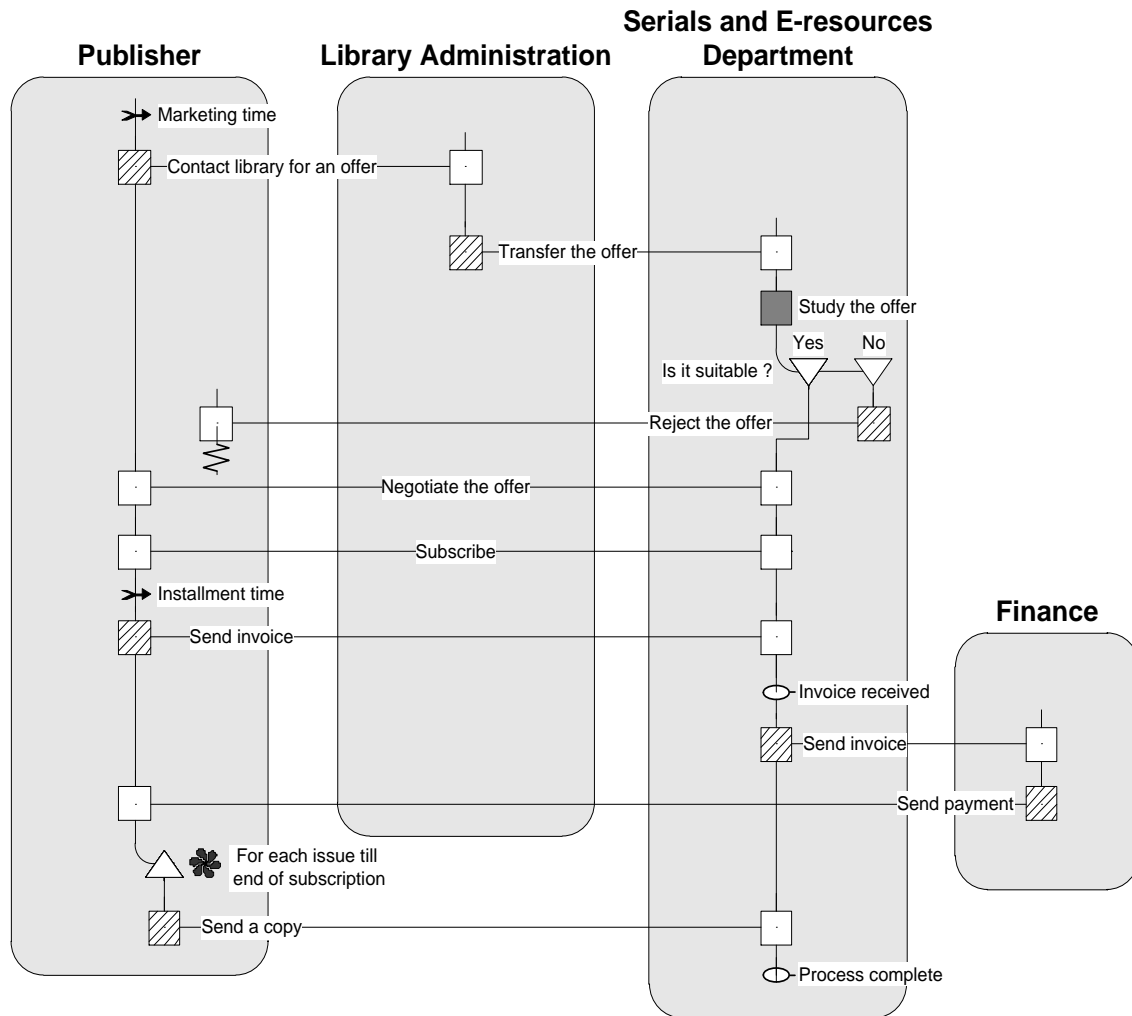
In the two figures above, it should be emphasised that they both represent the process of electronic resources acquisitions in JO1 (this includes electronic periodical acquisitions which is the subject matter of this section through to section 6.6). The main differences between the two figures are: the initiator of the process and the involvement of the consortium centre. In figure 6.1, the provider approaches the consortium centre to offer a proposal which is passed to the serials and electronic department through the library administration. One member of the serials and electronic resources department states:

*Those offers usually come from different representatives from various companies or publishers, for example one representative might say; we have 15 databases and we'll give you a trial, they might also give us a*

*discount if there is someone else who might share the database with us, so we negotiate with them and then subscribe.*

So, the serials department would then make arrangements with the providers to present the offer with attendance of interested faculty members. When evaluation of a trial is received from the interested faculty, the serials department revises their opinion on the viability and make a decision accordingly.

In figure 6.2, the initiator is the interested faculty. Members of academic departments could request certain journal titles. The library administration would pass their request to the serials and electronic resources department. There is what's called 'title unification' here, which means that the serials department makes sure that there are no duplicated titles (sometimes different departments can request the same title). After negotiating the offer, subscription to the title is processed.



**Figure 6.3 RAD for print periodical acquisitions process in JO1**

Figure 6.3 differs from figures 6.1 and 6.2 in that it deals with ordering print periodicals in JO1. It is still part of the serials and electronic department's job, but it was noted from the interviews that this process starts with marketing representatives from publishers approaching the library for offers of some periodical subscriptions. The member of serials department was asked if this is always the case, she said it could be publishers, individuals or representatives from the press (for newspapers purchase). When subscription is processed, publishers would arrange for delivery of periodical issues.

### 6.3.1 Associated challenges

One of the most important challenges faced in JO1 is the space problem for periodicals. It is interesting that JO1 users prefer print over electronic copies. When a member of staff in the serials and e-resources department was asked about the major challenges they are facing she answered:

*The space problem, that's why we tried to solve it by subscribing to desired periodicals electronically... But still, we think that there is greater preference for the print copies rather than the electronic ones, there is also some kind of dispersion for library materials. We have around 75% electronic resources, while we have 25% left for library material through purchase, gifts and exchange.*

Budgeting is certainly important but it seems from the interviews that JO1 is coping well with that. There is government support feeding into the public universities consortium, in addition, the library always tries to adhere to budgets available.

As mentioned earlier, there are eight members of staff in the serials and e-resources department in JO1, the head of the team pointed out a challenge related to the load of work. He states: "we must have more staff in, we must have at least 20 people in this team". As learnt from the interviews, his responsibilities include the following:

- management of resource access
- analysing statistical usage reports
- management of subscriptions between the university and the worldwide publishers, studying their offers, negotiating prices, producing promotional brochures and user guides
- announcing training sessions performed by publishers here at the university
- preparing presentations for each faculty to let them know about any new databases or subscriptions, those presentations are performed for users to make them aware of the subscriptions and to explain to them how they can get the most benefit from those subscriptions relevant to their fields

These tasks are performed by the head of the team, which means that there is no strong spirit of team work. If this person ever leaves, it will be hard and time consuming to hand the work over to someone else, and the head of the team states: “I’m the only one familiar with my work, nobody shares it with me, nobody has learnt what I do, so it’s not easy for someone else to take over”.

The head of serials and e-resources team also referred to the low payments and rewards library staff receive: “There is good morale and non-material appreciation but unfortunately no financial one, we don’t receive good payments compared to the efforts we make”. It is true that there is appreciation and also publication of any work done, as it has been verified from an item in the university magazine (Media and Public Relations Department, 2009). However, the financial aspect is also important to keep staff motivated and hard-working, otherwise, it will be easy to lose them, because in any good organisation, seeking job satisfaction and motivation is a priority. There are certain needs that should be satisfied in any workplace, according to Maslow’s hierarchy of needs, these are: psychological, security, social affiliation, self-esteem and self-actualization (Plate and Stone, 1974). Hosoi (2005) applied Maslow’s hierarchy of needs in academic libraries and gave “rewards” as an example in the self-esteem category, which is classified as a high-level need.

#### ***6.4 Periodical acquisition in JO2***

Moving to the next case studied in this research, the next Role Activity Diagrams are presentations of periodical acquisitions process in JO2. According to the data collected, the periodical acquisition process for print and electronic periodicals is different in this case as well, and therefore, presented in two different models. The roles identified from the interviews in the process as a whole are:

**Publisher/provider:** again refers to the party that provides the library with required material, it could be the publishers directly, who come occasionally to

the university to offer their material, or a supplier with whom there is an agreement to provide the library with books/journals.

**Library director:** for this process, the main role is to approve actions.

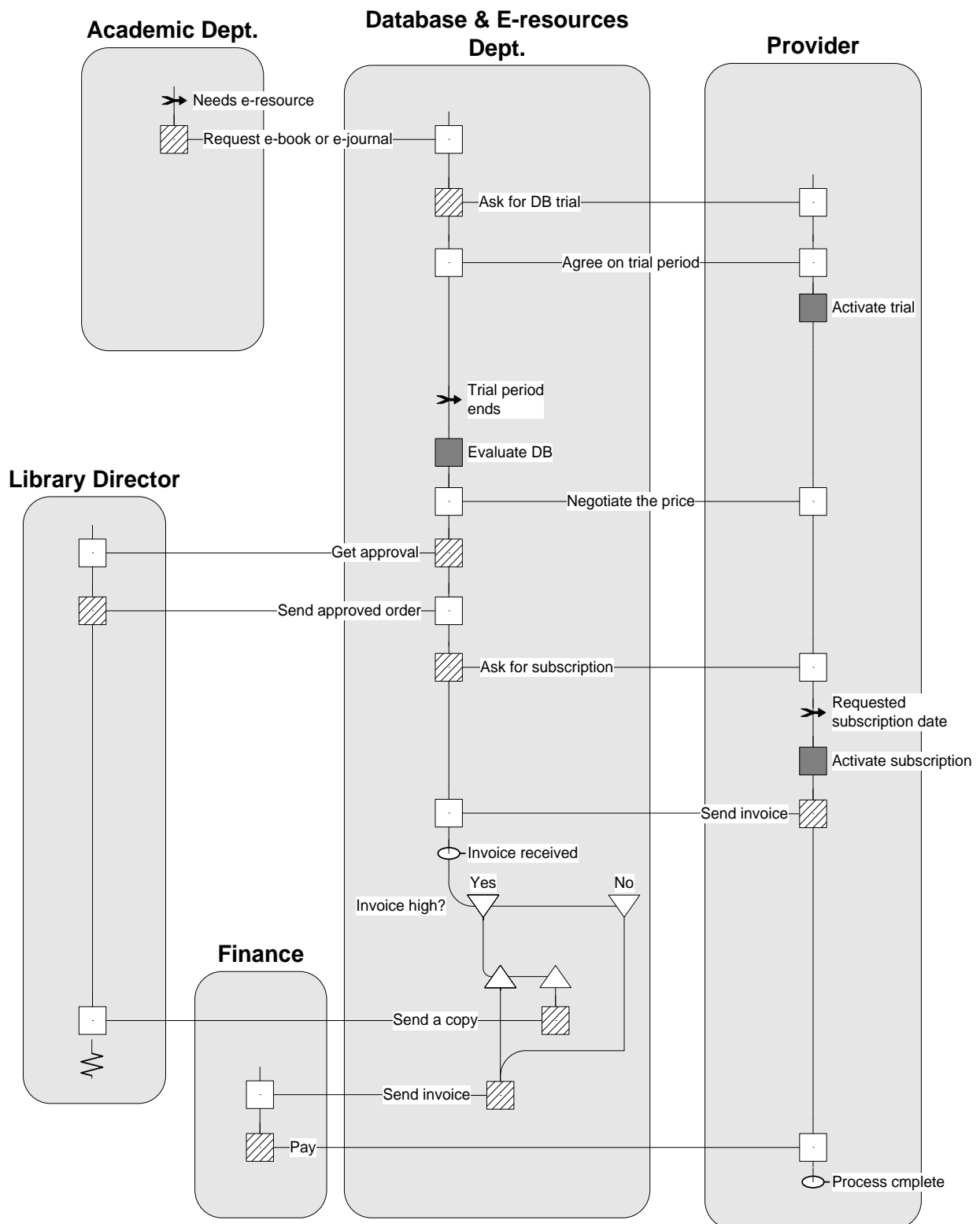
**Periodicals library assistant:** one member of staff who deals with print periodicals.

**Academic department:** refers to any teaching department within the university.

**Database and e-resources department:** deals with electronic periodicals.

**Finance:** deals with payments.

Just like JO1, the acquisitions department in JO2 deals with orders of print books and other print materials (except periodicals). Print periodicals in JO2 however, are dealt with by one member of staff, while all other electronic resources (including electronic periodicals) are ordered and managed by the database and e-resources department. The following two RADs look at periodical acquisitions in JO2, followed by some notes and brief description of each process.



**Figure 6.4 RAD for e-resource acquisitions process in JO2**

JO2 is a smaller university library with more limited budget. The process of electronic periodical acquisitions starts with a request from an academic department within the university. The request is directly made to the database and electronic resources department, which in turn asks the provider for a

trial. Note that the evaluation is done by the team rather than the academic department. Negotiations take place and an agreement is reached, when asked about negotiations, the head of the database team stated: “usually the price depends on the number of users - number of universities subscribing to it”. The offer is then passed through the library director for approval. Subscription is then processed, and a copy of the invoice should be sent to the director if it is considered high.

This process can start with the publisher approaching the university with an offer; in this case, the same steps are followed. Occasionally, journals orders can come from the library director, but not very often.

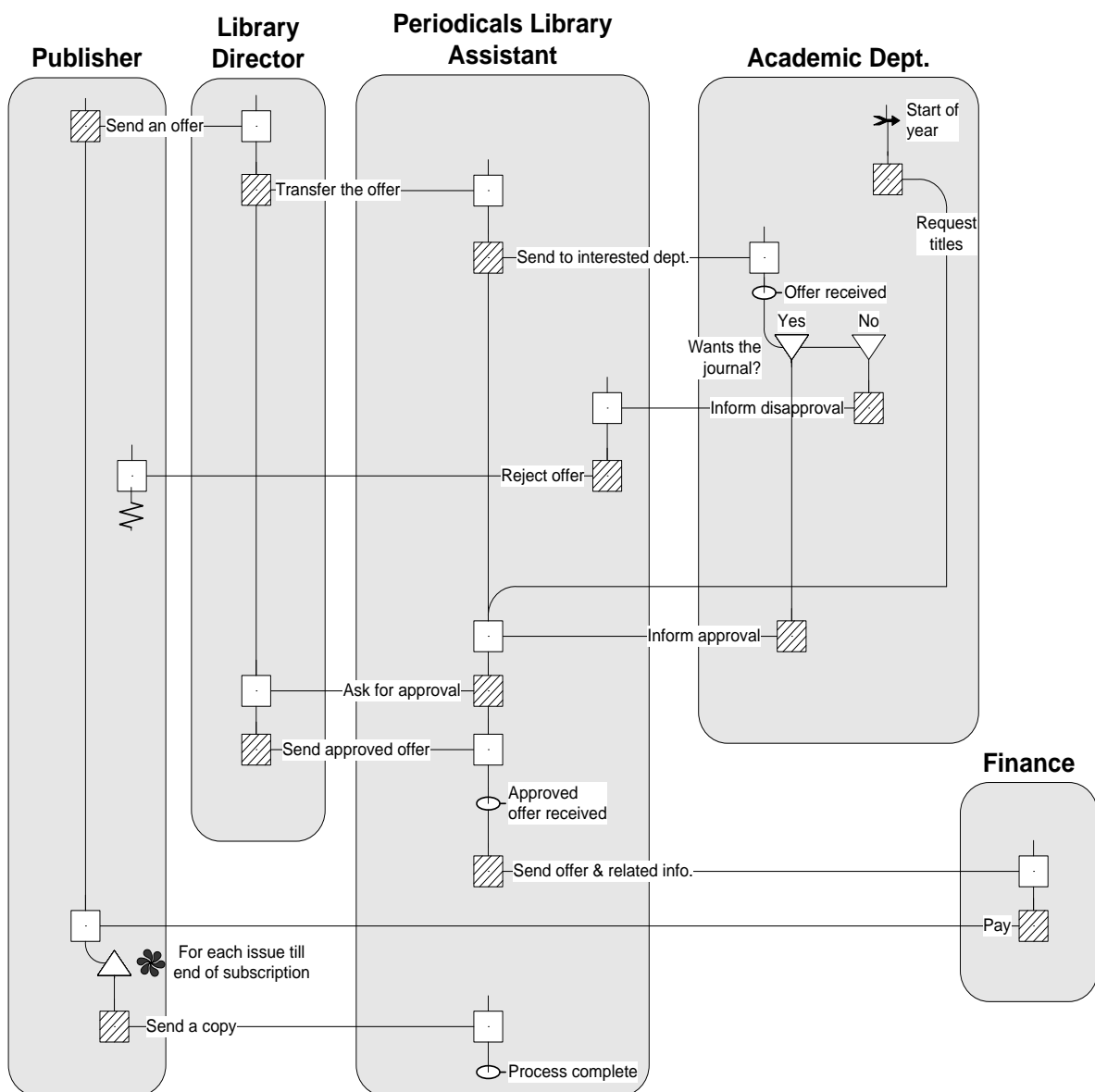


Figure 6.5 RAD for print periodical acquisitions process in JO2



From the diagram, it is noted that the process of print periodical acquisition can either start with a publisher presenting an offer or an academic department requesting a title. The publisher's offer would go through the library director while an academic department would contact the periodicals library assistant directly. If the title offered by the publisher is approved by the interested academic department and by the library director, it is then purchased.

Looking at figure 6.5, one can note that a different role deals with ordering print journals. There is only one member of staff in JO2 responsible for ordering print periodicals and managing them (periodicals library assistant). Her tasks include ordering periodicals, following up issues and renewing contracts by sending a renewal letter to the interested department for approval. It could be claimed that having one person to do this job is probably satisfactory as there is a limited number of journals allocated to each academic department (maximum of five allowed for purchase). The library assistant for periodicals states:

*It's worth mentioning that there are some regulations related to purchasing periodicals; for each speciality or department if you like, there is a specific allowed number of periodical print subscription, that is of five at most, when a department has five subscriptions and requests more, then we either ask them to cancel one or we just ask for managerial level approval - that's from the director.*

However; exceptions are made to Education and Arts faculties; they are allowed to have five to ten periodicals, as they do not have any electronic journals on the database.

#### **6.4.1 Associated challenges**

There are some challenges related to periodical acquisitions in JO2. Budget is spotted on the top of the list for the following reasons:

- (1) Although JO2 can be lucky to have some cuts on costs on some subscriptions due to being a member of the private universities consortium in Jordan (which offers better deals when more members

subscribe to a database). However, this is not always applicable, as JO2 offers some MSc programmes that no other private university provides. This forces it to bear the costs of relevant material alone. In addition to the different range of programmes offered by different private universities; the head of database team states:

*Some universities don't have many departments, for example; [name] University is specialized in either computer science or electronic engineering, I think they added graphic design too, so obviously they won't be interested in many other areas that we're interested in.*

- (2) There is no fund from the government to support the private universities' consortium in Jordan, unlike the consortium of public universities where government provides financial support.
- (3) There are some constraints released by the Ministry of Higher education that come in the way of expanding the library in size, which take into consideration the number of students in the university.

As mentioned before, the acquisitions department in JO2 handles only print book orders, print periodicals are dealt by one member of staff who is responsible for ordering the journals and following them up. Any electronic resource, on the other hand, is dealt with by the database team. Although this is the way JO2 deals with acquisitions, the library administration does not seem very happy about it, the director's assistant states:

*I think this is wrong in principle, but the library here follows the university policies for financial reasons, I don't think it is right, most of the other new library systems deal with it in a different way.*

When discussing the process of electronic resources acquisitions with the head of database department, any current challenges or difficulties were queried. The answer implied a high level of confidence in their work and quality of services, the head of department stated:

*With no exaggeration, we are the best of the private universities in Jordan when it comes to databases and electronic resources acquisitions. We have also become the approved database training centre for other universities.*

The claim that JO2 might be the best of the private universities in Jordan could be true; but other observations sensed no great ambition among the staff to compare performance with that of some of the public universities. Moreover, maybe they are satisfied at the moment with the library's size, quality, etc... but what if changes occurred later on? How are they going to deal with those challenges? If collections maintained are small and demands are modest, there is little pressure to move forward. This has similarities with the early catalogue crisis at the British Museum as stated by Blake (2002): "...If either of these factors changed, and the need to retrieve books in a speedy fashion increased, there would be a crisis. And that is what developed at the British Museum". The factors the author meant were: small collections and little demand – perhaps a vicious circle of small collections, low demand, low expectations then perpetuating low demand, and small collections.

Finally, there is the challenge related to users of the library, especially tutors who surprisingly did not seem to have much tendency towards using electronic resources. According to the JO2 director, attendance at training sessions held to train users how to use e-resources is very poor, the library director states: "I do send an email to the departments informing them about the sessions to be held and invite them to attend it for free but still the attendance is poor". In addition, developing students' skills in using online services and search could be crucial for their future careers.

### ***6.5 Periodical acquisition in UK1***

Coming to the UK cases now, there is evidence of recognisable differences here. The process of periodical acquisitions for both print and electronic versions can be modelled using one diagram, the same people are involved in the process and they do essentially the same job for ordering both print and electronic periodicals. The Academic Services Manager in UK1 identifies the main aspects of journals acquisitions that should be taken into consideration when ordering them: "There are many aspects considered when placing an order for a journal: selection, placing order, acquisition, budgeting".

The next figure is a Role Activity Diagram for UK1. The roles identified from the interviews are:

**Department representative:** in each teaching department there is a person whose job is to liaise with the library to facilitate the ordering process.

**Materials' acquisitions team in the library:** the acquisitions team in UK1 is responsible for ordering all materials in the library such as books, and journals. The team comprises eight members of staff, but not all are working full time. The full time staff they have got are the team leader, the deputy and another four people, and they have got another two members of staff who work part time.

**Electronic resources manager:** responsible for managing e-resources. When the financial year starts and the library budget is identified in UK1, the budget for e-resources is top-sliced as it is dealt with separately (separate from the acquisitions team).

**Assistant director:** the second person in the library hierarchy, who is in charge of the library services and day to day library services and plans for the future.

**Finance:** deals with payments.

**Supplier:** refers to the different providers the library deals with, to purchase books, journals or any library material. UK1 deals with specific suppliers for books and journals.

The following RAD represents the process of periodical acquisitions in UK1. The process starts with a department representative requesting a journal's subscription. They would contact the acquisitions team directly, who would carry out two activities in parallel; they would check available funds, whether this department has still got funds available from the money allocated for them, and they would also go through the catalogue to check if the periodical is already there in the library system Note that RAD allows choices, for example, if the department still needs the journal although they haven't got

enough money in their account, they would have to cancel a current title to replace it with the new one.

Acquisitions would then create an initial record, and place the order of certain form (print, electronic or both) according to the department's selection. For electronic orders, a copy must be sent to the electronic resources manager. The assistant director needs to approve orders before they are sent to the supplier and the finance pays in advance for journals subscriptions.

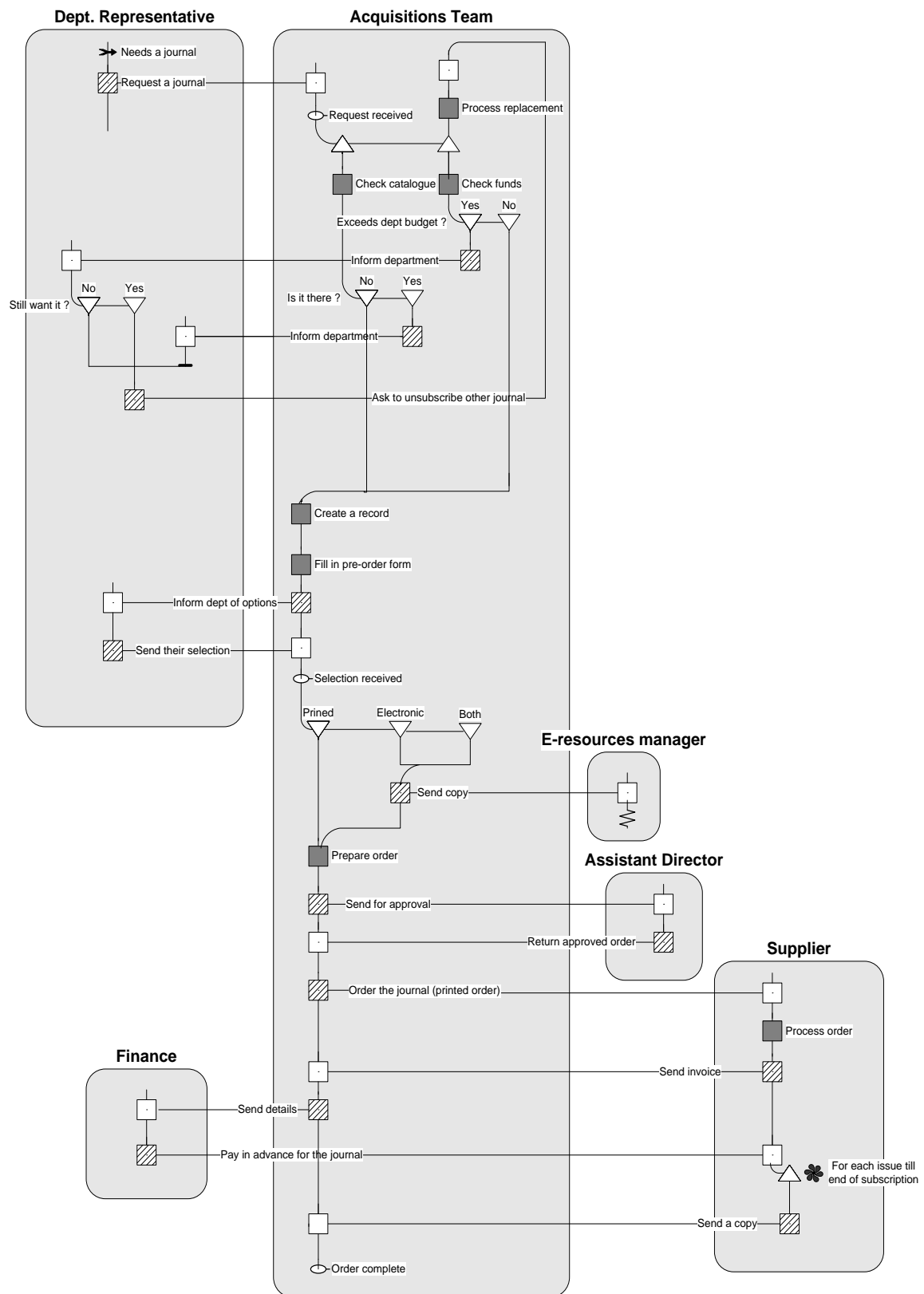


Figure 6.6 RAD for electronic and print periodical acquisitions process in UK1

### 6.5.1 Associated challenges

Higher education is adapting widely to the demands of students and student numbers. Challenges faced in UK1 revolve around space and budget issues. The Subject Support Librarian in UK1 states that in such a state of flux, the two campuses within the university ultimately need to be merged, and this merger means that the two libraries will be integrated within two to three years. Consequently, there will be a need for reclassification of stock, movement of stock, and getting rid of some stock as well (please refer to section 7.6.1 for details about how this problem reflects on cataloguing and classification). The Assistant Director confirmed this problem, when he was asked about the major challenges encountered by UK1 he answered:

*Physical merger which is a local problem rather than a national one. Developing a new estates strategy for the next ten years, some departments within the university are moving and merging over the coming years.*

Having more than one campus for universities in the UK is quite popular. This growth and dispersion over wide geographical areas creates units with differences among them to germinate and grow, although these units fall under the same organisational structure (Thomas, 1959). In UK1 differences occurred in terms of cataloguing and classification where different systems were adopted in different campuses for historical reasons associated with the original funding and management of what were separate colleges.

The Assistant Director in UK1 provided a classic current example within the university about an institute which has been part of the university since April 2008, but it is not located on the main campus. When the university aimed for a larger institute, three departments were merged to form this large institute, the merged departments were: the old institute itself and two other departments located on the main campus. The new institute is going to be split into two sites, the old site and the main campus site, but this merger is going to involve a lot of library integration, so the real challenge that UK1 is facing is the integration of libraries, with associated problems of stock integration. The Assistant Director states: “so in the next coming years we have to plan to bring those two libraries to the main campus”. The questions

raised by him were: “do we provide a new library or do we expand the existing library? Do we continue to have as many books as on the open shelves or do we increase the electronic access material?” Answers for such questions would depend highly on cost and available space.

As in other academic libraries, another challenge in UK1 is the inflation rate, taking into account the changes in the exchange rate. This is a general issue in the higher education as a whole – as the Assistant Director argues at the time of the interview (2008):

*This year in Aug, 15% to 20% increase was issued, so we have a problem in the budget. The problem with the economy internationally; the pound has declined against the euro. We have to move from print access to electronic access to materials, do we need more shelves or shall we get rid of the printed ones?*

The Subject Support Librarian also supports this opinion: “one challenge is the increasing cost of journals, it’s a nightmare”.

The Academic Services Manager stated that the library asks academic departments to look carefully to finances as this year there is a 25% increase in cost from last year. She also looked at the space issue as there are lots of books, catalogued books from various disciplines that don’t have enough space. Finally, the VAT (Value Added Tax) problem, although it is only applied on electronic resources rather than print ones, when the purchase is combined, VAT is again applied.

## **6.6 Periodical acquisitions in UK2**

The next figure is a Role Activity Diagram for UK2. According to the data collected from this library’s staff, the periodical acquisitions process for both print and electronic periodicals can be presented in the same model as the same people are involved in the process and they do essentially the same job (role) for ordering both print and electronic periodicals. As shown in figure 4.4, UK2 differs from the other university libraries selected in terms of its organisational structure. This feature was an attraction for the modelling, to



help consider other pathways through the library processes, and in addition to being specialized in postgraduate courses only, as was pointed out previously in section 4.5.

The roles identified from the interviews are:

**Academics:** refers to the teaching staff in the teaching departments.

**Information specialists-technical services:** falls under the information systems team (figure 4.4). This position title refers to subject librarians, who specialize in one specific area and liaise with other library staff to help order necessary library material.

**Journal review committee:** journal review takes place every year. The committee looks at journal subscriptions and their usage, prepares a list of potential cancellations and new items and sends it to all academics and waits for comments. A decision then is made and it depends greatly on the budget available.

**Finance:** responsible for payments.

**Supplier:** refers to the different providers the library deals with to purchase books, journals or any library material. UK2 deals with two specific suppliers, one for books and the other for journals. In some interviews, interviewees referred to suppliers as 'publisher', but it still means the provider.

The following RAD describes the process of periodical acquisitions in UK2. Note that there is a time range for the start of the process (Jan-May). Academics start the process by requesting a title, the information specialist would then collect sample copies, she states:

*The thing about sample copies is that publishers are turning towards electronic sample copies now, so instead of getting an actual item in your hand and pass it around so people have a look at to discuss; there is something on their website which is not very user friendly really, I just tend to print off the contents pages, it doesn't give you a feel of a magazine really unless you have it in your hand.*

After that, the annual journal review is conducted around June time, where budgets, current and new titles are discussed, based on usage statistics prepared in a form of spreadsheets. The information specialist states:

*The idea eventually is that by the time that the journal review comes around I've got a figure of usage for each subscription that we have and how many times it's been borrowed or snapshot of how much usage it's had in the library which is very difficult to get hold of and also how many times it's been downloaded electronically, so each title will then have what we call its weighting.*

A decision is then made about the list of titles to purchase, and a memo is sent out to academics to let them know what is happening. They would have three weeks to give back any comments they have, and negotiations can take place at this point. A final list of renewals and cancellations is produced and it is processed around August/September. Note that unlike UK1, orders are placed electronically rather than in print format.

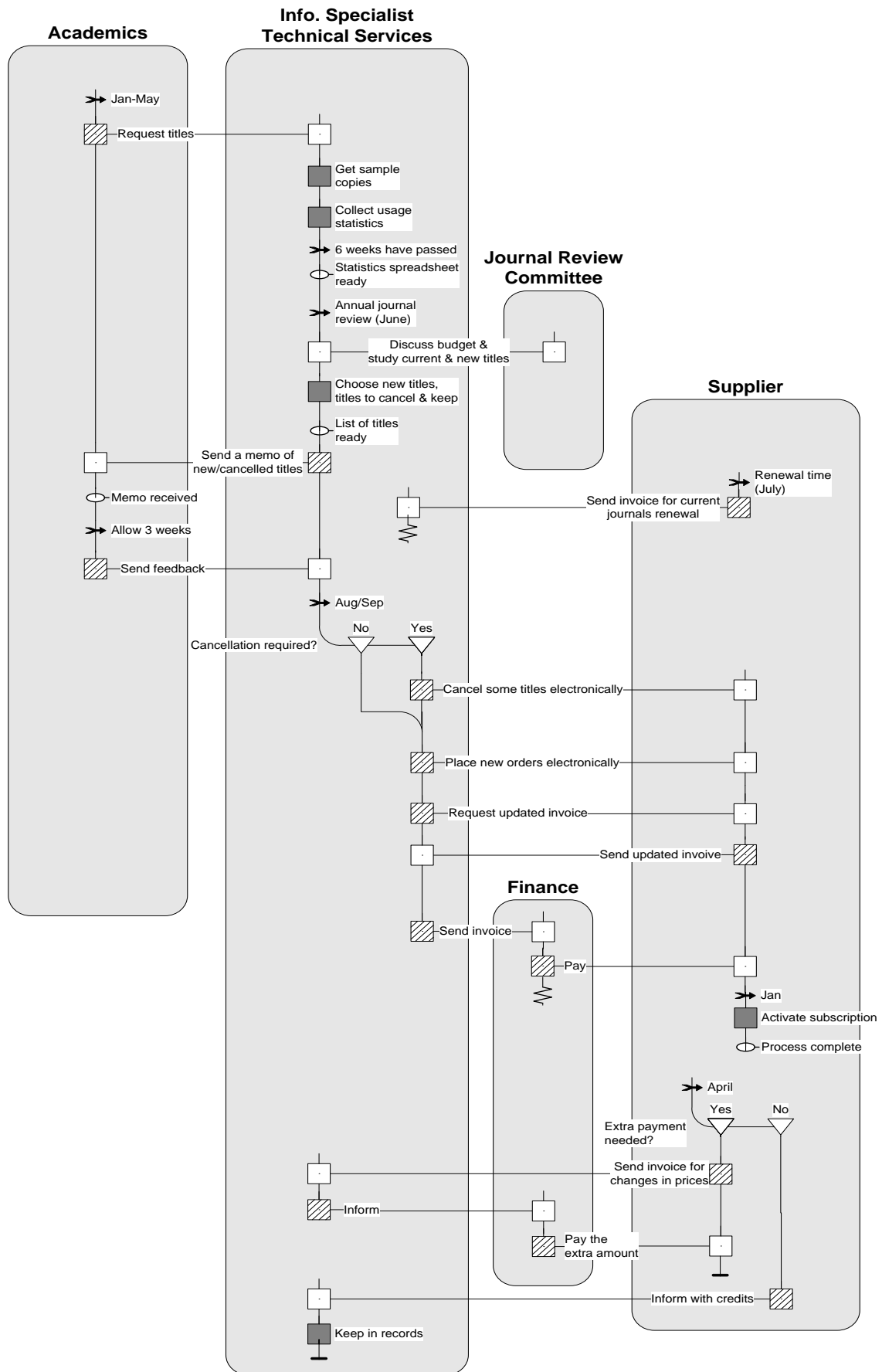


Figure 6.7 RAD for electronic and print periodical acquisitions process in UK2

### 6.6.1 Associated challenges

When members of staff in UK2 were interviewed, they were asked, just as all other libraries in the study were, about challenges they face. The real challenges that UK2 faces in terms of acquisitions and resource access are budgeting and developing better searching systems.

Constraints on budgeting are an issue. Each researcher has their own unique individual interests, and as it is not possible to provide extensive resource coverage for each very specific individual area of interest, that is one issue UK2 struggles with. Budgeting has also affected human resources as the university imposed a staff freeze, the head of Information Systems at UK2 states: “if anybody leaves we can’t replace them unless we put in a strong case for getting a replacement”. The Business Information Specialist stressed the same challenge: “... main challenges, no money! The economic recession has hugely increased the database costs, particularly the ones that we get from the US, you know because of the exchange rate”. As tight budget has affected human resources, it is probably not possible at the moment to face the challenge suggested by one Information Advisor responsible for circulation. She stated that the major challenge is:

*Too many students and not enough staff, because we lost our full time person, and we didn’t replace them, so we’ve gone from... who was three days, ... who was five days and myself who only went four days last Sep, have gone now to seven days between two staff and I’m expected to take part in Saturdays rotas, late night rotas and that includes the Fridays as well as the weekday, I’m also responsible for staffing the library and it’s quite a challenge because we don’t have enough people in the right place at the right time, there’re more part time staff than there are full time in terms of the information advisors at the moment.*

One of the Information Specialists in UK2 looked at keeping the catalogue up to date with what can be accessed as a challenge, “it is difficult to get list of journals from publishers to say what titles we can access from them, and all that data has to be put into the catalogue”.

The search facility in UK2 is poor – according to a Systems Specialist interviewed in UK2 - and that is one thing the library is looking at. One

Information Advisor responsible for circulation says: “the system is too wordy, not straightforward”. Regarding a better searching facility, UK2 has done a library satisfaction survey which has been circulated to everyone, as the number of students is small. The survey looked at many aspects such as noise, databases, environmental things and searching systems. Comments were received about the catalogue and the cross-searching system, there are lots of things to search using different user names and passwords, and they behave differently on campus and off campus, and that is why UK2 is working at the moment (at the time of writing) on moving towards new search system (Shibboleth), which simply allows users to access electronic resources using one user name and password, as a single sign-on provides more streamlined procedures.

Stressing the same point, the head of Information Services in UK2 discussed the problem of access to resources for off-site students. He stated that students off-site may confront access problems such as asking for entering user names and passwords while the system would not show what user names and passwords they should use. Students off-site may also be faced with different interfaces from those of on campus, and finally, when students seek help, they can phone information services at the library but as learnt from the head of Information Services, it is sometimes difficult to understand the problem remotely:

*It is sometimes difficult for our information specialists just to put themselves in the shoes of the customer and see exactly what they are seeing on their screens and it's actually quite a difficult process, negotiating somebody through a search or enquiry, when what you'll see may or may not be the same as what they see, and you can never be absolutely sure they are.*

On the other hand, there are certain things in terms of cross searching and meta searching that UK2 would like to do but faces obstacles in the way, the head of Information Systems in UK2 commented about such things:

*They're expensive and it's difficult to find the money to implement them and I think because we're postgraduates; meta searching isn't good enough for our students, a lot of them are PhDs, lot of them have to find everything on a particular subject area rather than just kind of stuff for an essay.*

Providing resources to postgraduates off-site is a target for improvement, and one information specialist interviewed states: "I'd like our off-site support to be more proactive". Other things that he discussed included the Google issue:

*It's the first thing people go to rather than the last thing, and I think we accepted that, we try to ensure people understand, you know, become information literate basically, and understand what they're getting and what they are not getting with Google.*

This point leads to the need for introductory and training sessions to be held within the university, which should emphasise good marketing strategies to familiarize students with the efficiency and reliability of the library's electronic resources compared to Google.

There are more challenges yet encountered by UK2, which, as mentioned before, belongs to a very research intensive university. According to the head of Information Services, the university did very well in the 2009 research assessment exercise, its funding has increased and therefore a high proportion of its income comes from research. However, this special status that the university gained led to a proportional reduction in money which the university earns through teaching. This means that the library has to support research activities in a very effective way because it is an essential part of their business. Such support would be through availability of resources and helping researchers demonstrate that their research has real impact on the wider community. Therefore the real challenge here is to understand the needs of research communities, and at this time barriers to information should be removed. This means that the role of information specialist who liaises with researchers is changing as those researchers do not have to come physically into the library. The head of Information Services commented that:

*If researchers join the university on short term contracts to carry out a specific piece of research, for six months or twelve months, we may not even know that they have arrived unless they use their initiative and come to the library or their heads of departments or their supervisors direct us to come, because they're not picked up by the normal channel, they're not registering at the same time that research students would be, they may not plug into the normal information literacy programmes that we provide, research students do, but there's a category I suspect of research staff that we might not pick up, so the*

*challenge is about trying to build very strong links between the library and its services and the needs of our research community.*

Finally, it is worth mentioning that space is not an issue for UK2 as they have massive space for expansion. When the university merged two libraries, they closed a big lecture theatre and converted that into rolling stands (mobile shelving). This is an example of repurposing space rather than creating new space, which according to Lynn, FitzSimmons and Robinson (2011) is cheaper. Moving towards e-resources has also helped in fighting the space problem.

## **6.7 Discussion and results**

In this research, it is concluded from the interviews that all selected libraries struggle to integrate electronic resources into their workflow, but at different levels. All agreed that the trend is now towards e-resources. When the library director at UK1 was asked if they will get rid of print journals some day, his answer was:

*I think at some stage we will; because we don't have space to keep them, again this is a national UK problem, there is a British Library initiative called UK Research, it is just about to be established and that's designed as a backstop for university libraries to be able to have access to print material on the long term if they want to get rid of print access, journals are not used that heavily, we can't just keep them on the shelves.*

The head of serials and e-resources department in JO1 is working on the same track and does encourage the use of e-resources, he stated: "e-library saves us 20 days worth of work". He also said that the use of e-resources costs less and saves space and that JO2 would need the current library size multiplied by four if it wasn't for the e-library. Not to mention that e-resources allow the production of usage statistics, the head of serials in the e-resources department states:

*With e-resources I can come up with the statistical report with one button, as a result I would then be able to support some specialities or aspects more than others, I would realize where to put more funds,*

*where needed, you know there are millions of features that makes the process much easier.*

Although the head of information systems in UK2 supports the above statements, the budget however forms an obstacle, it is a real challenge, he states: “we’re concentrating on electronic... we also would like to get hold of electronic journals but the VAT issue is meaning that it’s cheaper not to do that at this stage”. In spite of the discounts libraries get on electronic journals, these discounts do not cover the VAT.

Finally, for JO2, the main attention is focused on users, both academic staff and students. This includes improving online services, arranging training sessions to advertise new databases, and developing students’ skills when dealing with electronic resources.

RAD captures processes and shows their roles and interactions, as Ould (2005) states: “RAD shows the activity of roles in the process and how they collaborate”. RAD offers the following:

- RAD offers a common process representation that facilitates understanding of the process.
- It is an analysis method that can be documented for further work or for any new appointed staff.
- It can serve as a basis for improvement and management by supporting the analysis of process performance and behaviour.
- It is flexible in drawing and it offers multiple useful features like triggers, iteration and deadlines. This might throw the analyst’s attention when time is vague or undetermined in the process.
- Looks at activities- can some be done in parallel to save some time?

*RAD reveals features, but does not solve problems.* It acts as a searchlight, reveals problems and suggests potential ways of attacking those problems, sometimes it is very clear but at other times much more effort is needed to reveal it (Ould, 1995).

Controlling costs of periodical acquisitions is one of the issues that RAD demonstrates. The results from the RADs provided so far show helpful



activities for ensuring that what is purchased will be what the library really needs for its users, mainly academic staff and students, following are examples from the RADs:

- In JO1, figure 6.1, the activity “evaluate” undertaken by the faculty asserts that the serials and e-resources department purchases electronic resources and subscribes to databases that are evaluated by the interested faculty, hence, needed by it. This reflects many issues such as the user’s involvement in acquisitions and control of costs since the library does not buy anything not needed by its faculties.
- Activities such as “negotiate the offer” in figures 6.2, 6.3 and 6.4 in JO1 and JO2, also show that costs are considered and controlled in acquisitions.
- The case refinement called “exceeds budget” in figure 6.6 in UK1, shows that costs are controlled by allocating certain budget for each department, and if this department exceeded the budget then they would need to cancel an existing subscription.
- In UK2, figure 6.7 shows an activity undertaken by the journal review committee and the information specialist, which discusses the budget and studies current and new titles.

There are other bits of RAD that can show whether items will be made available on time or not. This notation in RAD ( ➤ ) refers to a trigger, for example, the start of academic year or the time when a journal is needed. In figures 6.2, 6.4 and 6.6 (JO1, JO2 and UK1 respectively), this trigger is named “needs a journal”, which emphasizes that journals can be ordered any time throughout the academic year, which means that items will be available on time.

Coming to possible improvements revealed from the RADs. Most of the next results discussed in this section are inspired by Ould’s four different styles of process improvement when using RAD. These styles were discussed in section 2.5.2, but for a quick reminder, they include:

- Point-wise improvements, which are applied to individual activities or interactions in a process.
- Flow-wise improvements, which include changes in the order of activities and interactions within a role.
- Improvements by restructuring roles,
- Finally, the most radical change of realigning the organisation to the process.

Following are results from the previous models. Results are listed below according to the four styles of process improvement:

#### 1) Point-wise improvements:

- Communication problems. In figure 6.1, where there is communication between the publisher and the consortium centre; what is the best way to communicate? Knowing that the centre is based in another city that is one hour and fifteen minutes' drive from the university studied, meetings are not very easy to schedule. How about video conferencing? Adding such resources (communication resources) is an example of point-wise improvement, because it would enhance the process by providing tools to people to do their job, hence speeding up the process; "we are concerned with increasing the efficiency (use of resources) or effectiveness (reliability and quality of result) of individual activities in the process" (Ould, 1995)
- When is the right time? Or what is the right number of requests that shall make the serials division proceed with the order? When the serials division in figure 6.2 receives requests from faculties, they carry out the activity called "titles unification", this means they wait till they have sufficient number of titles, how do they decide when enough is enough? And what if a faculty needs the journal urgently? This will delay the process. The time frame should be included here and clearly defined. This is an example of point-wise improvement, which means changes are applied to individual activities. If there is agreement on the number of titles to trigger the "title unification" activity, it is then possible

to reduce the overall cost by adding more cases (titles) to be processed by an actor.

- When speaking of time, there is also no deadline or determined period of time in figure 6.1 for the consortium centre to receive offers. When compared to UK2 however, a great strength in figure 6.7 is the attention paid to time and deadlines which reflect systematic work.

## 2) Flow-wise improvements:

- Complexity or insufficient sequencing. Sometimes it is useful to avoid 'waiting for approval'. Instead of waiting for library administration approval after ordering the journal, sending a copy of the invoice at the same time to both finance and library administration will save time and run the process more efficiently, especially as the serials department in JO1 seems to be the decision maker when it comes to e-resources acquisitions. One member of staff in the serials and e-resources department in JO1 was asked whether they need the administration approval for purchasing electronic periodicals, she answered: "No, there is big trust in the library's decision". As a result, in figures 6.1 and 6.2 in JO1, three signatures are needed to process payment correctly, which is acceptable, but it is much better to do that in parallel (sending out copies of invoices at the same time rather than waiting for one signature before requesting the other). Increasing parallelism results in increased autonomy of each role, decreased dependencies and minimized delay time. This is an important point as it is all 'paper work' exchanged between departments by internal mail, which is time-consuming. Increasing parallelism is an example of flow-wise improvement suggested by Ould (1995), as it is targeting improvements within one role through changes to ordering of activities and interactions.
- Although JO2 in figure 6.4 saves time when dealing with invoices by sending out copies in parallel to both library director and finance, still, in JO2 and UK1 libraries, in figures 6.4, 6.5 and 6.6, the order is sent to the assistant director to sign for approval. Knowing that budgets are

predetermined, isn't it time to minimize the paper work? This would then lead to the first point previously discussed in point-wise improvements; that is of enhancing communication between roles using better tools.

### 3) Improvements by restructuring roles:

- Unnecessary tasks. Such as “transfer the offer”. This is an activity carried out by the administration to pass the offers through to the serials department. Faculty representatives approach library administration in figures 6.1, 6.2, 6.3 and 6.5 before they reach serials or periodicals departments. The ‘Administration’ role here can be considered third party in between other roles’ interactions, which does not add much value to the process really. Ould (1995) looks at a process within an organisation as a pizza, which needs to be cut between different roles, the more it is cut, the more strands of cheese one gets, the more messy it becomes, these strands of cheese are similar to the interactions between roles in RAD. In this case, interactions can be reduced by allowing faculty representatives to go straight to the serials division for ordering journals, especially when the budget is pre-determined and the library (such as JO1) is trusted to take decisions. This point can be looked from different perspective and different style of improvement, by applying the 80:20 rule from generalists to specialists. This is a method suggested by Ould (1995) to help analysts improve processes by asking whether every piece of work (in this case requested title) needs to be seen by the library administration, maybe it is better to limit them to those of a certain value for example.
- In UK2, there is quite big load on the role named “information specialist” who does a lot of work as can be seen in figure 6.7. Moving activities between roles is an example of improvements by restructuring roles.

### 4) Realigning the organisation to the process:

- Adding roles. Figure 6.3 - which represents RAD for print periodical acquisitions for JO1 – does not seem to consider academic departments when reaching a decision about purchasing periodicals. On the other hand, according to figures 6.1 and 6.2 and based on the interview with the head of serials and e-resources department in JO1, there is a huge work load on this role, more roles or more staff within this role should be added to help the head of department do the job, not only does this make the pressure less, but also helps that future members of staff understand the job well in case this one member of staff - who does everything - leaves. These are certainly examples of realigning the organisation to the process, which refers to major changes to the organisational structure, such as deleting roles or adding new ones.
- Looking at the initiator in the UK libraries. Having the department representative initiating the process all the time makes one think about adding new roles to act as initiators, for example, deals offered by other providers or publishers directly. Such roles can be added to the process if the library can meet the academic's needs as these have the priority. Adding new roles is also an example of realigning the organisation to the process.
- Adding more activities within roles. In figure 6.1, the consortium centre would receive offers from publishers then pass them around to all members of the consortium (all public universities). Each university would then study the offer and decide. More team work and communication within this role (members of the consortium centre) could be emphasized here to discuss the offer and how beneficial it could be to each university with consideration of cost being distributed between the members.

Having the diagrams analysed and results for process improvements extracted, there are still some factors that affect the quantitative behaviour of the process (Ould, 1995), and these can be concluded from interviews or from the setting itself, these are:

- The number of staff carrying out activities. This could be found in JO1. As mentioned in section 6.3.1, the head of serials and e-resources department asserted that more staff should be employed to distribute the work load and to have more people familiar with the job rather than having only one person doing most of the work. This would certainly affect the efficiency of the overall process positively.
- Seasonal work – how intensity of activity varies during the year. If one goes back to figure 6.7, one can see that there are certain times when work is more intensive. For example, in June there is the annual journal review where decisions are made regarding what journals to keep, what to cancel and what to order. Comments from all academic departments are gathered and usage statistics are analysed. So this is really a seasonal kind of work that takes place only in that period of time of the year.
- The availability of tools and other resources needed in some roles, for example, clarifying and making better communication medium available between members of the consortium centre in figure 6.1.
- Economic and currency situation. Budgeting is a very crucial aspect that affects periodical acquisitions process, especially in the UK when the pound fell against the euro during the doctoral research (although it has been quite stable lately). In addition to the inflation rates and the increase of journal prices, the academic services manager in UK1 states: “This year there is a 25% increase in cost from last year, however; there is no way you could gain this increase in budget”. There is also some related regulations which affect the process, such as the VAT, which applies of electronic resources, this means academic libraries would have to pay VAT even when they combine purchase (buy both print and electronic resources as a package).

## **6.8 Book acquisitions in JO1**

As a recap, this chapter discusses two major types of materials acquisitions; these are periodicals and books. Periodical acquisition was discussed previously (sections 6.3 – 6.6) along with discussion of the results (section 6.7). The following sections, however, deal with book acquisitions in the four selected libraries.

The next Role Activity Diagrams represent the book acquisition process in JO1. The first one demonstrates the general sequence of activities for ordering a book, while the other diagram illustrates a special case; when a publisher or an author approaches the university to present a title. Note that in the case institutions in Jordan, the process of book acquisition includes all print books, while e-books are dealt with separately. The serials and e-resources department in JO1 deals with all sorts of electronic materials, including e-journals and e-books. Please refer to figures 6.1 and 6.2 for a reminder about e-resources acquisitions.

For this current process, the roles identified from the interviews in the process of print book acquisition as a whole are:

**Faculty:** refers to any faculty in this university. There is a large number of faculties in this university, each embraces a number of departments that offer various specialities, for example; the Faculty of Information Technology includes three different departments each offering a speciality, the Faculty of Education however has got five departments each offering more than one speciality. There is a faculty representative for each faculty, who liaises with the library.

**Acquisitions:** the acquisition team in JO1, which is composed of seven members and responsible for ordering Arabic books and books in any other language. Note that the team is responsible for print book acquisitions and does not deal with any electronic orders. It is the responsibility of the serials and e-resources division to deal with all kinds of e-resources.

**Publisher:** refers to the party that provides the library with required Arabic books. Note that this university does not deal with international publishers directly, so whenever the term 'publisher' is mentioned it is then a local publisher, when the term 'agent' is mentioned it is then for international books.

**Agent:** the communication link between the acquisitions team and foreign books providers.

**Accounting:** to check the budget available for print books.

**Library committee:** for purchase approval.

**Finance:** deals with payments.

**Library director:** authorization from library director is needed when the library receives offers from different publishers.

As mentioned earlier, there are two ways of starting the book acquisitions process in JO1, and academics usually start it, but publishers may initiate the process by sending catalogues of new titles.

Figure 6.8 represents the process of print book acquisitions in JO1 using RAD. The process starts with the academic faculty requesting a new book title, acquisitions would then search for the title in the library catalogue to check if it is already there. If it is not, the book's initial details are entered into the system along with the status of the book and then the order is placed. If it is an Arabic book, it is ordered directly from the publisher. However, if it is not an Arabic book, it is then ordered through an agent. Negotiations do not really take place as there is a fixed 23% discount usually. When the book is received, it is checked for verification reasons, as there could be something wrong with the order, in this case, the agent/publisher is contacted and the invoice is updated.

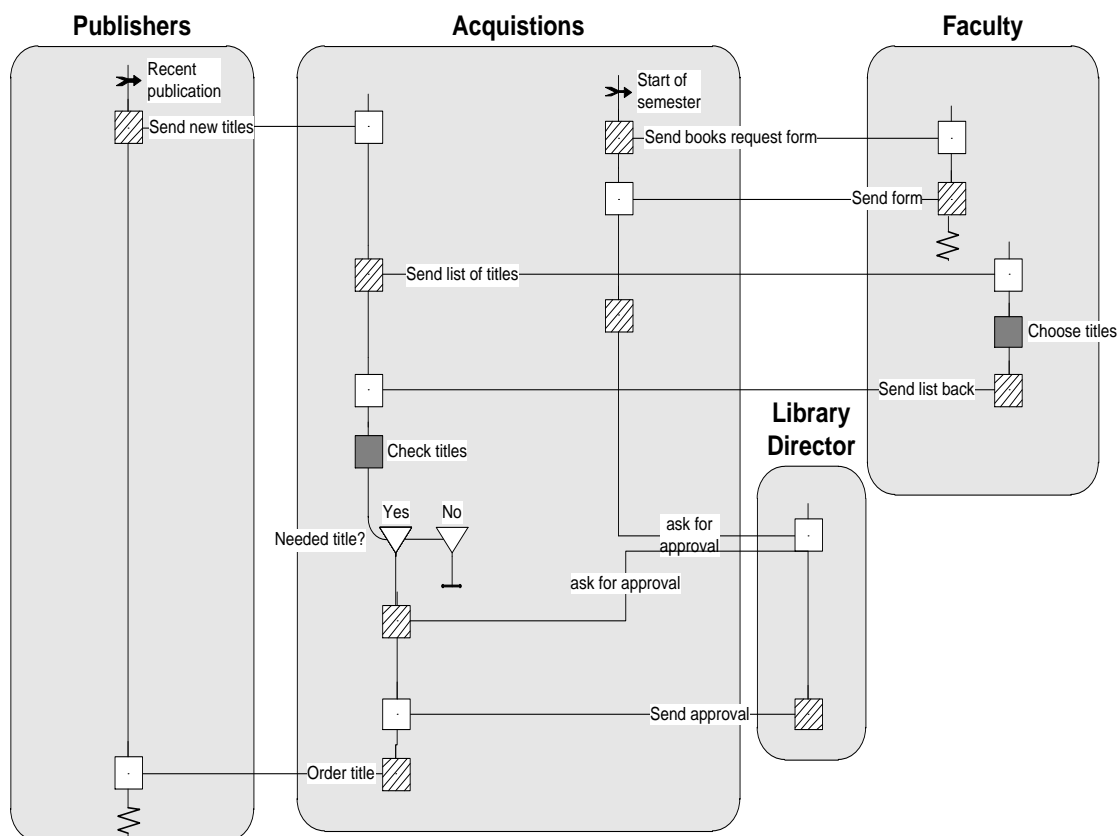
Note the 'if statement' for checking the budget, where for orders over 100.000 JDs, the accounting department would have to be notified to approve. After that, authorization with three signatures is collected from the library committee, and acquisitions would assign accession numbers to the books,



payment is then processed. For wrong orders, cancellation is required, but according to an acquisitions team member interviewed, this is unlikely to happen.

For figure 6.9, note that there are two lines of activities in the 'acquisitions' role, the first one supports the normal flow of actions (publisher advertising or marketing for a new title), in this case, publishers start the acquisitions process by advertising and marketing a new title, acquisitions would contact the interested academic department that decides whether or not they need this title. The second one however starts at the beginning of each academic year, when forms are sent out to academic departments for new book requests. The second line of activities is a routine chain of actions that takes place every academic year. It is worth mentioning that forms are exchanged between departments by internal mail, which takes some time really.





**Figure 6.9 RAD for print book acquisitions process in JO1 – a special case**

### 6.8.1 Associated challenges

This chapter discusses the process of material acquisitions. It is divided into two main parts to discuss periodicals, then books. As a result, some of the challenges that have already been discussed in the periodicals sections might also apply to books. In JO1 for example, problems within the serials and e-resources department were discussed in section 6.3.1.

Although JO1 does not really suffer from space problem for books, however, there is a problem in the space allocated for reading. The two library assistants interviewed from the Reference department assert the necessity of expanding the reading halls:

*When it's exams period, students wouldn't find a space to read in the halls, it becomes too crowded, also, the photocopy machines are in the*

*lower floor which isn't really handy. I think we should have a big reading hall with nice atmosphere and adequate lightning.*

## **6.9 Book acquisitions in JO2**

The next Role Activity Diagram represents the book acquisitions process in JO2. Again, the acquisitions department deals with print books only, as electronic books are dealt with by the database and e-resources team. Please refer to figure 6.4 for electronic material acquisition in JO2.

The acquisition process for print books starts with academics requesting titles. The next diagram illustrates the activities involved in the process and their sequence. Figure 6.11 however, represents another possible way of book acquisitions in JO2, which is through donation. It is primarily the academics' decision whether or not to get a specific book, JO2 doesn't choose books. The Head of Acquisitions team in JO2 states: "The library doesn't really decide on its own what books to buy".

The roles participating in this process are:

**Publishers:** like JO1, in this case, the publisher refers to the party that provides the library with required Arabic books.

**Agent:** the communication link between the acquisition team and the international book publishers (non-Arabic books).

**Acquisitions:** The team responsible for ordering print books.

**Academic department:** any teaching department within the university.

**Director Deputy:** grants approval for books' purchases.

**Finance:** deals with payments.

In figure 6.10, the process starts with academics requesting book titles. The "if statement" is for classifying orders according to language. For Arabic books, publishers are approached, while for books in non-Arabic languages, an agent

is contacted. There is no hidden action here, it is just that different publishers are approached to get different prices so they can choose the cheapest. The list of orders along with their prices is sent to the director deputy for approval, orders are then placed.

There is not a time limit for receiving a book, in JO2 they are not very concerned about receiving books late; and it does not usually occur anyway. When books are received, accession numbers are written on them, and invoices are sent to the finance department who processes the payment.

The last action “enter book details” is performed by a person different than the one who does the ordering. The details are accession number, bar code and some general book information, the detailed information however is left to cataloguing and classification to deal with (the book is sent there after ordering is complete).

For figure 6.11, the role initiating the process is the ‘author’, who might approach the university library and donate a book they wrote. When books are received by donation, the library would consult the interested academic departments, whether they need such books or not, if yes, the library would accept the donation and take the library director approval.

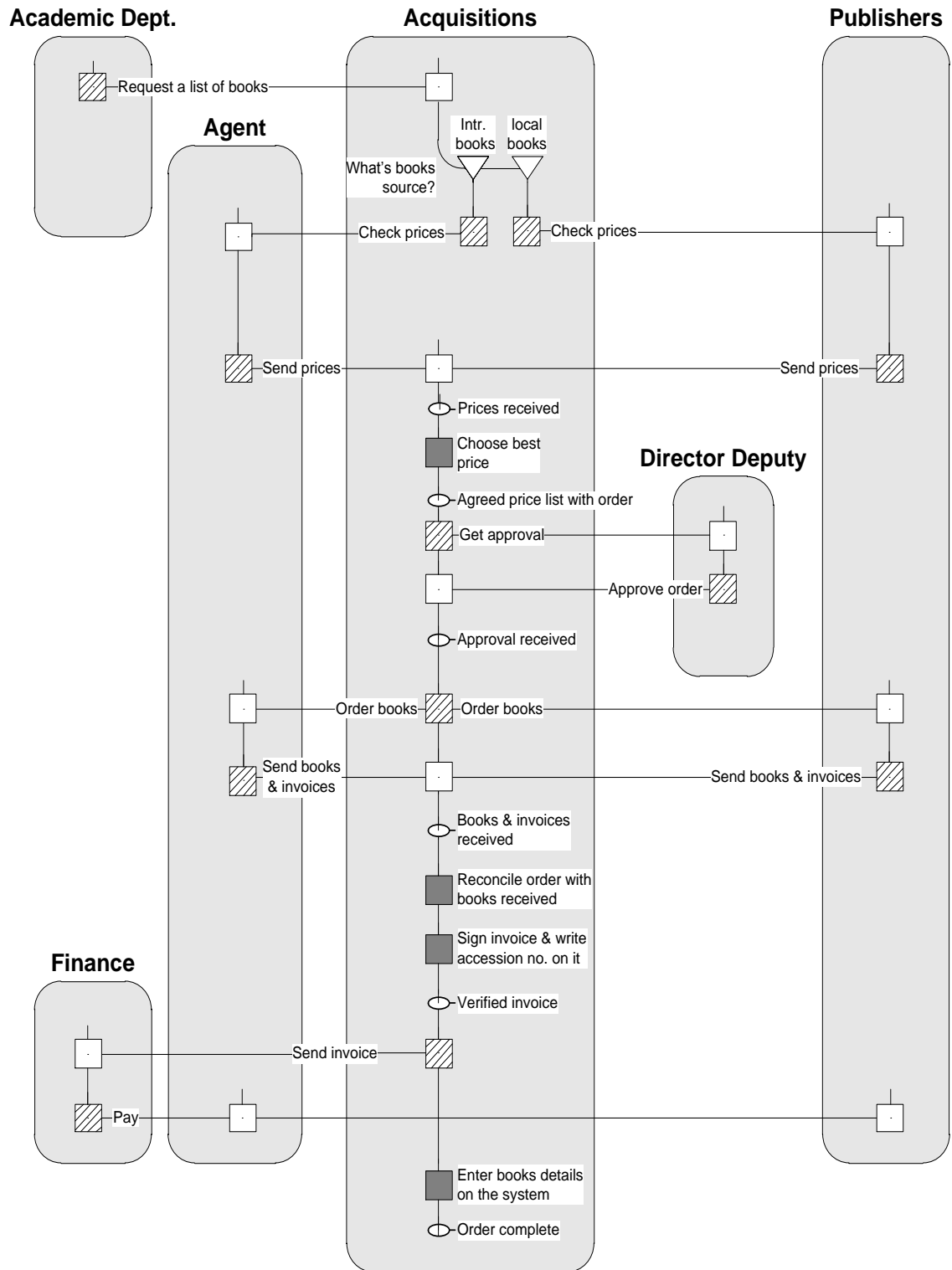


Figure 6.10 RAD for print book acquisitions process in JO2

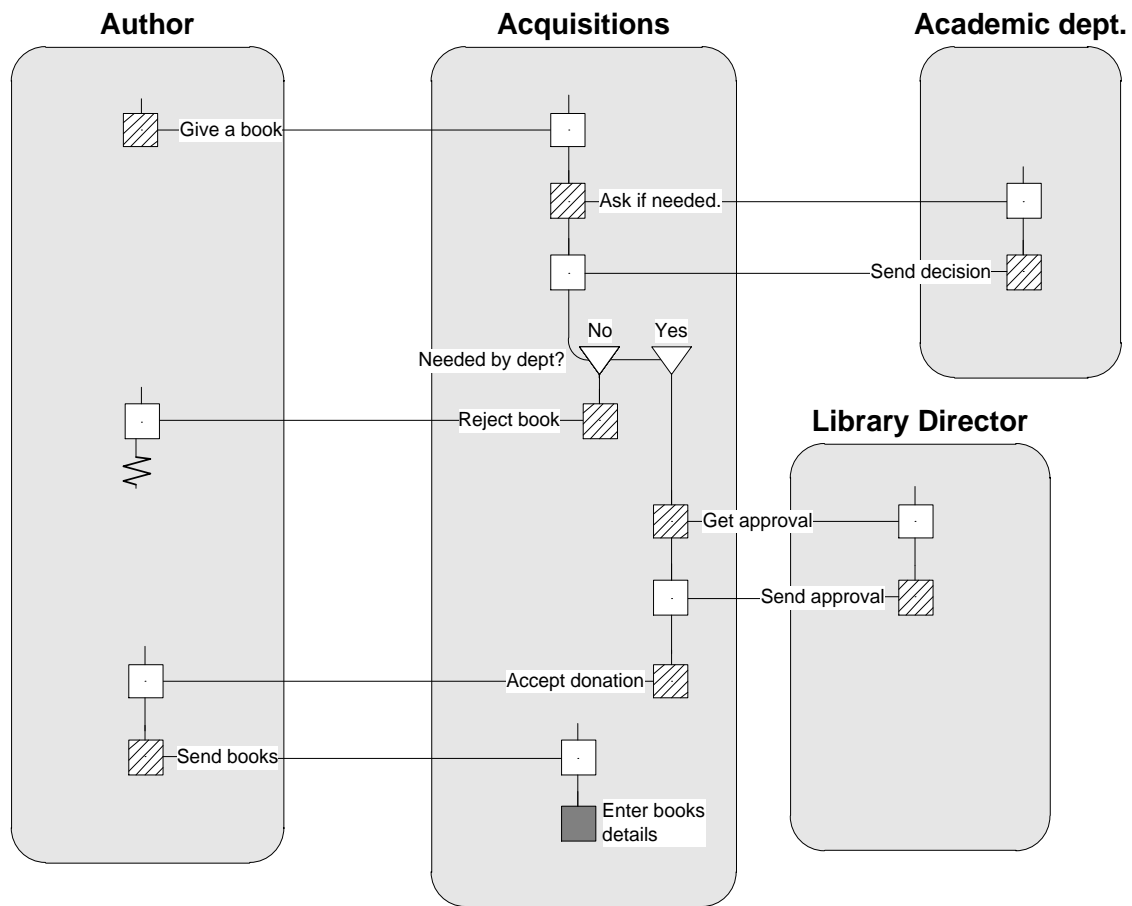


Figure 6.11 RAD for print book donations process in JO2

### 6.9.1 Associated challenges

As mentioned earlier in section 6.4.1, JO2 faces many challenges, and the constraints on budgets (for example) are considered an obstacle against improvement and development. There is also the problem of user uptake of emerging technologies, which seems to be low. Both the director and the assistant director referred to this problem and considered the user a big challenge. Not only do most of them lack research skills, but also they rarely attend training sessions held to train them how to use e-resources, and there is even no tendency for the academic staff towards using e-books. According to the assistant director, there are some students who have a background and knowledge in research, and are also passionate about the library, but they are few in number.

## **6.10 Book acquisitions in UK1**

Coming now to the UK libraries, where unlike the Jordanian cases, the book acquisitions process includes both print and electronic versions. The next Role Activity Diagram represents the book acquisition process in UK1. The roles participating in this process are:

**Department representative:** a person representing any of the teaching departments within the university.

**Acquisitions:** the team responsible for material acquisitions for UK1. The acquisitions team in UK1 is responsible for ordering all materials in the library such as books, journals, etc... The team comprises eight members of staff, but not all working full time, the full time staff are the team leader, the deputy and another four people, while the other two work part-time.

**Supplier:** the specific book suppliers that UK1 deals with. Sometimes books can be ordered online, for example from Amazon.com, for various reasons such as requiring individual books urgently.

**Assistant director:** this role participates in this process to give for approval for book purchase.

**Finance:** deals with payments.

The process starts with academics, they send requests of titles in different formats, could be an email, or in the internal mail, and so on. The acquisitions team dates the request, checks if the item is already there in the catalogue and if details are correct. Then they would look for a catalogue record, if one was found, it is used, if none was found they create a new one. Acquisitions would then decide on the supplier, they usually deal with specific book suppliers and they normally choose the cheapest.

Another 'if statement' appears on the RAD to check whether the order is online or print order, if it is online, it is sent directly via the system to the supplier. If it is a print order however, authorization is needed from the assistant director and then the order is posted to the supplier. When books



are received (whether it is only the URL for e-books or the physical books), invoices are created online, this means the total amount and a code are entered, the code tells the finance from which budget money should be taken out. The actual paper invoices used to be coded using a code slip but now are coded using a stamp, a member of staff interviewed from the acquisitions team argues that the slips looked better and the rubber stamp does not necessarily stamp properly. Invoices are then double checked, signed and counted. It is worth mentioning that there is a cut-off point of two years for receiving books.

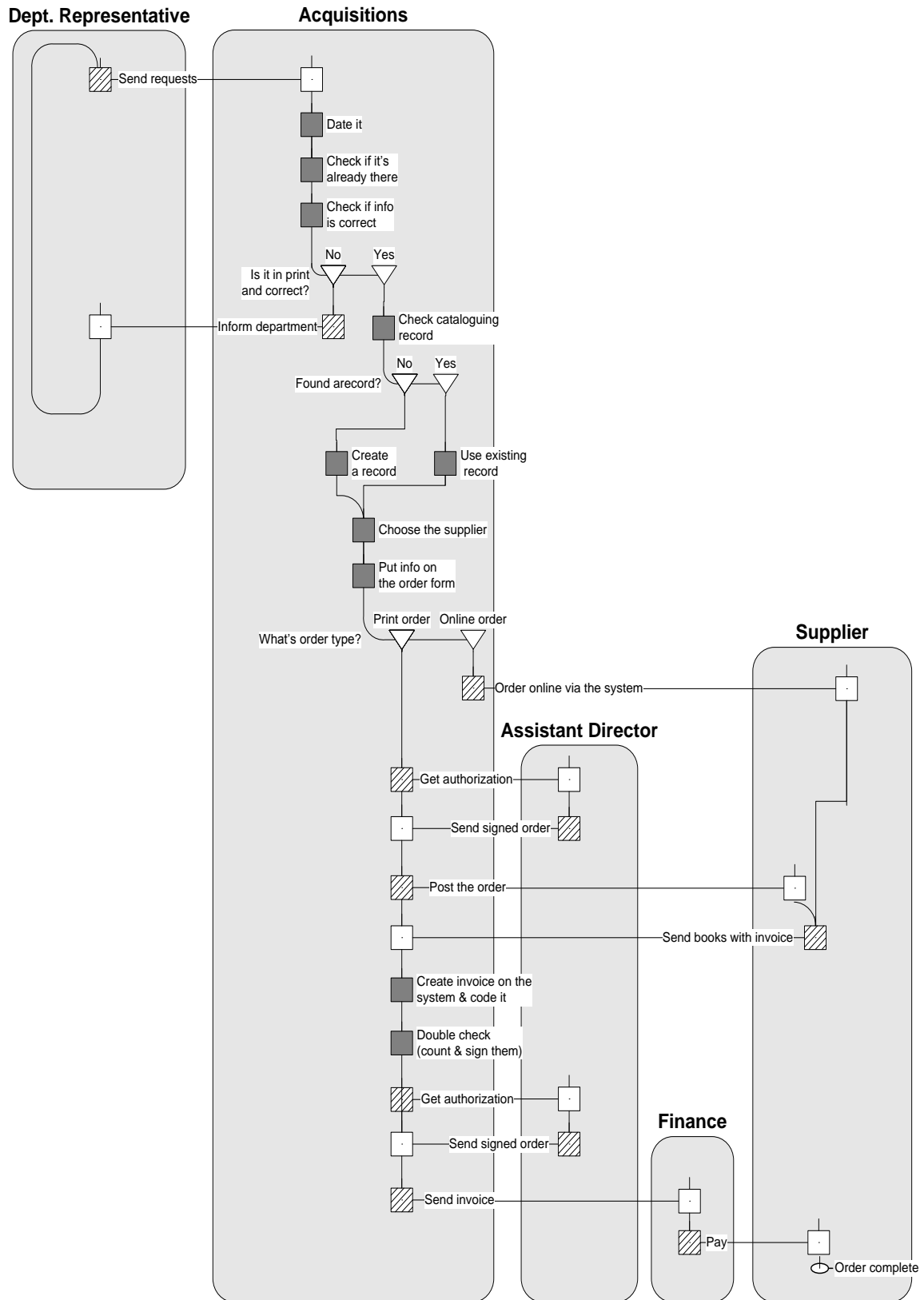


Figure 6.12 RAD for book acquisitions process for UK1

### **6.10.1 Associated challenges**

Many challenges facing UK1 were discussed in section 6.5.1. These included the space issue, the rise in journal prices and the constraints in budget. Just as the increased number of print journals are hard to shelve and store in the library, the same applies for books. A library assistant in the collection management team states: “at the moment I think space is very important, the usual print vs. electronic”. In addition, the current university strategy regarding space is a challenge, it is a challenge to standardize collections from branch libraries, and this has imposed great deal of property work: “we are doing as much property work as possible to try standardise collections and to look at duplicate holdings and try get everything ready as soon as we can”. A member of staff in the collection management team added, regarding the space for books:

*I think it would be nice to have a more purpose-built external store for storage area, we have a huge amount of material in there now, and the building in which it's in wasn't necessarily designed for library books, so lighting is inadequate, shelves are very high, that kind of thing, I'd like to see a much lighter place as a store, I'd also like to see a much lighter library with more daylight coming in and more space generally both for books and people, but I don't think that's going to happen.*

There is one more challenge about encouraging students to use the library. Students might come from colleges or schools that do not have such a traditional library, or could be on the other hand, sophisticated and used to searching skills, but this is hard to discern and provide for. It seems that there are students who don't use the library, in this case, another challenge according to the library assistant would be: “getting those students to actually come into the library to use its resources fully”.

## **6.11 Book acquisitions in UK2**

The book acquisition process in UK2 includes both print and electronic versions just as in UK1. The next Role Activity Diagram represents the process in UK2. The roles involved in this process are:

**Academics:** to represent any teaching department within the university.

**Subject specialists:** those specialized in certain areas of expertise, they liaise with academics to help choose the appropriate material for the library.

**Acquisitions:** the team responsible for material acquisitions in UK2. There are two members of staff forming the acquisition team who are called Information Advisors. One of them does the ordering and the other receives the books.

**Provider:** the specific book suppliers that UK2 deals with, for example: Dawson.

**Finance:** deals with payments.

The process usually starts at the beginning of the financial year, in August, but it does not mean books cannot be ordered throughout the year. The selection of books comes from a decision made by both academics and subject specialists who get to meet at the start of the financial year to decide on books to order. When a list of books is ready, the subject specialist would check their availability on the system, and if the book is available electronically, the academic department is informed. However, if there are few copies available in print or the requested book is not available at all then a decision on the number of copies/extra copies needed is made.

When subject specialists choose books, they take into consideration any student coming in asking for extra copies of core texts. Subject librarians liaise with academics, they take the reading lists and they also choose other books to order. When they send the paper copies of requests to the member of staff responsible for book ordering in acquisitions they make two things clear in the paper copy of the order: from which budget they wish to deduct the cost; and how many copies are needed. When interviewing the information advisor in acquisitions she explained how subject specialists come to decide on books to purchase, and she stated:

*The subject specialists are given reading lists, these are top priorities, they liaise with the academics and you know students come in and say*

*we really need this book we haven't got enough copies so they'll buy more copies of that.*

Paper copies of requests are then sent to acquisitions who create a record if it is not there on the system, and attach the order to the record. Books are then ordered electronically (whether the requested book is print or electronic copy). The provider would then activate subscription - and at the same time - send the books along with their invoices (or just the invoice and the URL if the book is requested as electronic). Note the concurrent paths in RAD, the facility of presenting activities done in parallel. The acquisitions would then validate the order and load books on the system. The concurrent paths appear again here when acquisitions keep the print copy of the invoice and send an electronic one to the finance department who processes the payment.

This way the process is complete, but it is worth mentioning that there are a few other things associated with this process, these are:

- When ordering books, there are no negotiations with suppliers; there is usually a fixed 20% discount.
- Second hand or online orders (like orders from Amazon) need credit card use, this would need authorization from any team leader. If the amount exceeds 10000 pounds, authorization should come from the library director.
- Payments are never processed in advance for books.
- After payment, books go to classification (if it is a first copy), or it goes straight for processing if there are other copies on the shelves.
- Although orders (titles of books requested) are received by acquisitions in a form of print copies, orders from providers are processed electronically: EDI process (Electronic Data Interchange).
- The member of staff in acquisitions who downloads a brief record or creates a new record is different from the member of staff in acquisitions who receives the book and deals with barcode later in classification and cataloguing stage.

- As mentioned at the end of section 2.5, UK2 themselves thought of modelling the book acquisition process. The Information Advisor responsible for ordering books in UK2 follows a kind of simple process chart she created to represent the process of book acquisition. Please refer to Appendix 3 to view the chart.

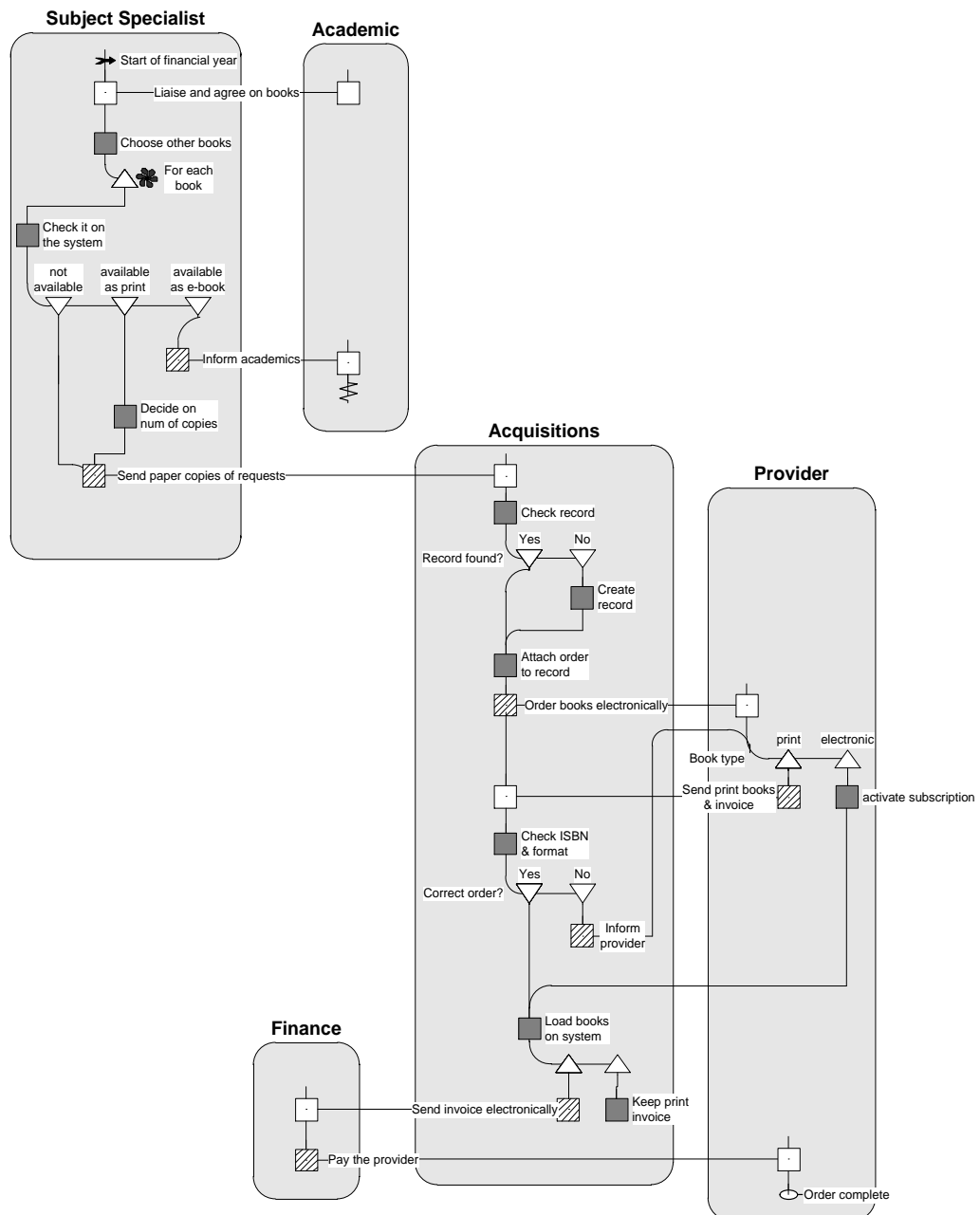


Figure 6.13 RAD for book acquisition process for UK2

### **6.11.1 Associated challenges**

Other than those challenges - mentioned earlier in section 6.6.1 - of budget constraints, high exchange rate and moving towards a better catalogue and searching system, there are some challenges concerned with this particular process of book acquisitions. The Business Information Specialist pointed out that keeping the balance between e-books and print ones is a real challenge.

There is also the challenge of book accessibility, the Business Information Specialist states: "... also making sure that when we have the access to the e-books it works properly". There have been some incidents where an assignment deadline was getting close and a key book was needed, the library purchased it in an electronic form but students can't get hold of it, so making sure that the book is accessible is a necessity because as the Business Information Specialist suggests: "if we're reducing the number of print copies and paid for the electronic copies we actually need to keep the accessibility of it".

## **6.12 Discussion and results**

Looking at book acquisition processes in the four selected libraries, it is noticeable that all libraries struggle to integrate electronic resources into their workflow, but at different levels. All agreed that more e-books should be made available to users. The discussion in section 6.7 applies here too.

As mentioned before in section 6.7, *RAD reveals features and does not solve problems*. It acts as a searchlight, reveals problems and suggests potential ways of attacking those problems (Ould, 1995). The models of RADs presented in book acquisition reveal the following results, which are listed according to the four different styles of improvements:

1) Point-wise improvements:

- Introducing better tools for communication and reducing paper work. Emails can be used to shorten cycle time. This is particularly for JO1 and JO2 where list of requests comes in by internal mail.
- As time and deadlines form a good feature in RAD, more precision can be added to the diagrams by clarifying any deadlines, such as; maximum time for books to arrive or time of the year when the process can start. Figures 6.9 and 6.13 take this into consideration.

## 2) Flow-wise improvements:

- Complexity or insufficient sequencing. As RAD looks at activities and reveals whether some can be done in parallel to save some time or not (Ould, 1995), at the end of the process in figure 6.10 for JO2 for example, sending the book's invoice to finance and entering books details on the system can be done in parallel to save time, knowing that different people perform these activities. This point is a kind of flow-wise improvement which reduces the overall time by increasing parallelism, which in turn increases the autonomy of each role, decreases dependencies and minimizes delay time (Ould, 1995). Moreover, there is some kind of complexity in figure 6.8, where three signatures are required for approval from the library's committee in JO1 after books purchase, and a fourth one would be required if the amount was over 100,000 JDs. This procedure – if necessary - is probably more useful to take place before ordering books, otherwise it is considered “figurehead” rather than purposeful, and it would slow the process, especially as approval letters travel by internal mail between members of staff, which leads to the following point, it is now appropriate to minimize paper work. In figure 6.9, however, the library director's approval is gained before purchasing books coming from publishers, which makes more sense as it is purposeful then.
- Does every purchase need to be authorized by the director? Note figure 6.13, where the role “director” doesn't exist. In all other RADs, it is necessary to get authorization from either library director or director's



deputy. According to 80:20 rule - from generalists to specialists, getting approval can be limited to those purchases of a certain value.

### 3) Improvements by restructuring roles:

- Reducing interactions. Note the paper work in figure 6.12, where authorization is needed twice from the library director. Interactions can be reduced between roles to speed up the process. This is an example of restructuring roles and what they do.
- Work load on roles. One can notice the difference in work load between acquisitions in UK1 and in UK2. The role “subject specialist” in UK2 should not be that different from the role of “department representative” in UK1, however, the subject specialist in UK2 seems to bear a lot of acquisitions burdens. So some moving of activities between roles is probably necessary in figure 6.12. Note that in figure 6.13, UK2 seems to have achieved some balance in activities between acquisitions and subject specialists, this is in contrast however to figure 6.7 of periodical acquisition in UK2, where the role “information specialist” was over loaded.

### 4) Realigning the organisation to the process:

- Adding more activities within roles. Note that figures 6.10 and 6.12 do not show what happens if the ordered book was not correct. An ‘if statement’ is needed just as in figures 6.8 and 6.13.
- Figure 6.10 shows that the library does not check if requested books were available on the system electronically or not. They just proceed with the ordering process.

### 5) Other notes:

- All RADs assume that all books orders are accepted, as the diagrams do not show other cases, such as rejecting orders because of budgets for example.

Having the diagrams analysed and results for process improvements extracted, there are still some factors that affect the quantitative behaviour of the process (Ould, 1995). Just as discussed in section 6.7, these are:

- The number of staff carrying out activities. This could be found in JO1. As mentioned in section 6.3.1, the head of serials and e-resources department asserted that more staff should be employed to distribute the work load and to have more people familiar with the job rather than having only one person doing most of the work. This would certainly affect the efficiency of the overall process positively. This problem is also spotted in figure 6.12, where acquisitions in UK1 has huge work load with small number of staff, primarily one person, doing the job.
- Seasonal work – how intensity of activity varies during the year, a library assistant from the cataloguing and classification department complains from the work load in certain period of time when piles of books come in, such as exhibitions and binding periods, or when gifts are received in large amounts. Seasonal work is also clear in figures 6.9 and 6.13, where book orders usually start at the start of semester or financial year respectively.
- The availability of tools and other resources needed in some roles. For example, this could be replacing some paper work with emails in JO1 and JO2.
- Economic and currency situation. Budgeting again is very crucial aspect that affects book acquisitions process, especially in the UK with the pound going down against the euro during the period of the doctoral research.

### **6.13 Chapter six summary**

This chapter discussed the process of material acquisitions. It started with an introduction and overview of changes in acquisitions along with an outline literature search on how to enhance resource access. It then demonstrated

the processes of material acquisitions, more specifically, periodicals and book acquisition in the four academic libraries chosen for this research. To represent these processes in RAD, the chapter introduced two distinct parts:

- (1) The first part (sections 6.3 to 6.6) introduced periodical acquisitions in RAD. Both UK libraries look at the process as a whole for both print and electronic versions, while in Jordan they deal with the different versions separately which increases the number of models needed to present the process, this is one of the main points to differentiate between the two sets of sites.
- (2) The second part (sections 6.8 to 6.11) deals with book acquisitions, and again, UK libraries seem to have both electronic and print books orders presented in one model, while in Jordan two different models were needed.

After each part, a brief discussion was introduced to analyse the diagrams, it is concluded from the interviews that all selected libraries struggle to integrate electronic resources into their workflow, but at different levels. The RADs provided were able to visualize many issues such as: controlling cost of periodical acquisitions, which could be spotted through activities such as “evaluate” the databases to be purchased, and “negotiate” the offer. Such activities ensure that what is purchased is what the library really needs for its users.

The RADs provided were also used to reveal process improvements derived from Ould’s four process improvement types. The suggested improvements varied between the four types: Point-wise improvements were revealed such as enhancing communication between some roles and setting a deadline for some activities. Flow-wise improvements were also suggested such as doing some activities in parallel to save time, and minimizing paper work. Examples of improvements by restructuring roles were removing unnecessary tasks and moving activities between roles to lower the work load. Finally, improvements that seek to realign the organisation to the process were also revealed such as adding new roles.

Analysis of the diagrams helps to question the validity of doing things in a particular way. By closer inspection of the activities within one set of processes some of the bottlenecks are more obvious and suggestions can be made to streamline processes.

## **7 Chapter Seven: Cataloguing & Classification Process**

### ***7.1 Introduction***

This chapter introduces an important process within libraries: cataloguing and classification. After a brief introduction about the process and its history; RAD is used to model the process in the four cases selected for this research, followed by analysis of these models.

Although classification is needed to complete cataloguing, cataloguing and classification are two separate activities. One can use any classification system with any suitable cataloguing automation system (Wasserman and Polk, 2006). Following this is an introduction about the basic principles of cataloguing and classification, the most popular systems used and the way cataloguing has changed as a result of automation.

### ***7.2 Cataloguing definition and history***

Cataloguing is an important process within libraries as it is used to create an index to libraries' collections and help users find what they need. It also helps librarians understand how to organise knowledge for retrieval. Gorman (2002) states that "cataloguing is the intellectual foundation of librarianship – it is the way in which good librarians, in all fields, think". It is essential to have professional cataloguers within libraries, to be able to provide coherent catalogues (Gorman, 2002).

A catalogue in a library describes each title it embraces and attaches it to the classification shelf location assigned to it (Wasserman and Polk, 2006). Each item in a library should have a record in the catalogue. A record has three distinct parts:

- (1) The description, which contains all bibliographic information about a title such as author's name, item's title, publisher, publication date, etc...
- (2) The subject headings, which identify the content of an item, these are important and should be worked on carefully, as a book title may not directly indicate its content. This process should be systematic and consistent, to help users access all related materials on any subject area they are looking for. Subject headings (or subject index terms) help users find the item in a subject search if the title is not helpful. They also help with the probabilistic searching that is used by some of the big library management systems software. Chowdhury (2008) states:

*A probabilistic information retrieval system ranks the documents in decreasing order of their probability of relevance to the user's information needs, and a probabilistic information extraction system locates the chunks of desired information based on their probability of relevance and browses them from the documents already retrieved.*

- (3) According to Markey (2007), embedding post-Boolean probabilistic searching ensures the precision of searches in online library catalogues. To investigate whether cataloguers and managers undertake activities that support new user-focused models or not, a Cataloguing and Indexing Group (CIG) conference was held to discuss these issues and provide proactive ideas in attempt to answer this question. McLoughlin (2010) reported on the conference. He referred to work by Steele (reported in 2011), in which the author states that inconsistencies are legitimate expressions of the cataloguer's interpretation of the Library of Congress Subject Headings (LCSH) rules. McLoughlin (2010) adds that Library of Congress is also US biased. Steele (2011) suggested a solution to this problem by providing computer software that aggregates records from various catalogues (cLCSH). The programme he demonstrated supported a simultaneous search of twenty library catalogues for the same item to compare LCSH headings that had been applied, in the hope of choosing the most common headings and avoiding inconsistency. In the same

conference, and most importantly, more related to process improvement, Hunt (2010) asserts the fact that little or no published research is conducted to apply techniques to cataloguing workflow. He suggested a generic Japanese management tool called 'process map' which starts by asking everyone in the cataloguing department to post their activities on a wall paper, in attempt to identify a flowchart with functional areas. The aim is to come up with any 'wastes' in the process, the seven 'wastes' revealed in Hunt's work at University of Warwick were: waiting time, transport, component design, inventory, over production, motion and finally, defective goods such as "downloaded catalogue records which do not match the item you have on your desk, or items being transported by a circuitous route through the building" (Hunt, 2010).

- (4) The shelf location, which is basically the classification number, it directs users to the item's location on library shelves. According to Wasserman and Polk (2006), the shelf location is sometimes called a "call number", as years ago when users requested or "called for" books in libraries, a member of staff would get it for them.

Cataloguing rules began in the early 19<sup>th</sup> century. The rules suited linear presentation, either in printed book catalogues or in card catalogues arranged alphabetically. Card catalogues were the only entry point to access library holdings. Library of Congress produced printed cards in 1901, which led to a great revolution that has continued till this day as it created the activity of sharing for cataloguing production. In 1908, the American Library Association (ALA) Cataloguing Rules were issued, and then revised again in 1949 as the Rules for Descriptive Cataloguing. The publication of the AACR1 (Anglo-American Cataloguing Rules) was in 1967, followed by the second version of it in 1978 (Coyle and Hillmann, 2007). The AACR2 govern exactly what information should be included, their order and how each line should be punctuated. This ensures that cataloguing in all libraries is done uniformly and correctly (Wasserman and Polk, 2006). Such accuracy is important if searches require an exact match to the string entered, and aiming for

uniformity helps when merging catalogues e.g. the COPAC catalogue for the UK universities and national libraries.

Therefore, in traditional cataloguing, all information can be found on the cataloguing card, which acts as a main entry for an item. However, for each item, there must be a card set which includes the main card, a subject card, added entry cards for each added entry, and a shelf list card where one finds copy information and price on. Cataloguing is a special area of specialty that requires training and expertise (Wasserman and Polk, 2006).

Moving from traditional cataloguing to automated cataloguing, in the 1960's, catalogue entries became MACHine-Readable records, which means computers can read and interpret data within cataloguing records. So MARC (Machine-Readable Cataloguing) became the carrier for libraries' cataloguing data. Initially, those MARC records were used exclusively by Library of Congress to produce the printed card sets at their typesetting operation department. By the late 1970's, when computerized library catalogues started to appear, MARC records became the entries in the computerized catalogues. MARC embeds tags which define information. The information that makes up the catalogue record is entered into fields and sub fields that are associated with different tags.

In the 1990's, card catalogues in a database format (Online Public Access Catalogue) became the dominant library catalogue at that time, and the revolution of the World Wide Web led to a new essential way of connecting users to the library catalogue (Coyle and Hillmann, 2007) .

MARC became the middleware between librarians and technology professionals. Today, in the development of technology and electronic document production, it is now possible to import catalogue records from one library to another by having a computer protocol named Z39.50, which allows two computers to communicate and retrieve information (Wasserman and Polk, 2006). This technology allowed more ease and flexibility within libraries as they are usually able to find records elsewhere, unless it is an in house item, or in some other rare cases. In an interview with a member of staff from acquisitions in UK1, he stated when asked about finding cataloguing records



elsewhere: “90 something percent of the time we do find something”. As a result, MARC provides reliable sharing of information, but needs accuracy when first entering information.

Although outsourcing is helpful most of the time, it is still essential to have in-house experts in cataloguing, and Hoerman (2002) states that “local expertise could develop a local catalogue that meets local needs”.

The last bit to discuss here in electronic cataloguing is linking, which reflects the number of copies a library owns. As each item, in fact each copy of an item has a unique barcode, the barcode numbers for copies of the same item are attached to its record. Each should be attached individually. This allows counting how many copies a library has (Wasserman and Polk, 2006).

As noted previously, early cataloguing rules in the early 19<sup>th</sup> century, like those of the British Museum catalogue in 1814, were developed to handle paper-based resources. The 20<sup>th</sup> century however, introduced new formats of information and resources, where musical recordings and motion pictures were produced. By the end of the 20<sup>th</sup> century, a big change occurred, that is the explosion of digital information and the internet revolution. Coyle and Hillmann (2007) discussed many changes that took place during the 20<sup>th</sup> century. The first change is related to information resources, how their format has been changing over time as mentioned above. There is also the change in cataloguing technology with MARC as explained previously in this section. In addition, the information environment has also changed with the internet revolution, as Spanhoff (2002) states:

*Since the mid-1990s the greatest threat to cataloguing has been the growth of the internet ... with its sophisticated search engines that compete with library catalogue interfaces, and its ease of use and ready availability that lead searchers to consult it before the library catalogue and draw people away from the library.*

This revolution should make librarians rethink about a simple standard way to describe the new forms of intellectual resources. So in this era of mass digitization, and with the existing competition with other ‘knowledge organisers’ such as Google; the Online Library Catalogue should struggle to preserve its reign. Markey (2007) states:

*By the early 2000s, Google registered 700 times more searches on a daily basis than the online library catalogue for the statewide campuses of the University of California served on a monthly basis.*

According to Spanhoff (2002), cataloguers tend to return to early cataloguing rules and principles whenever they face a challenge, while in fact, cataloguing rules should change in response to emerging technology and challenges. As the factors mentioned above affect academic libraries: Coyle and Hillmann (2007) believe that the vision of current cataloguing should make radical transformation according to these changes. They state that it should approach users' services better, hence, be more focused on users' needs, and those users who have also changed as they became more skilled in this interactive and highly connected world. This can be done through applying principles of systems analysis to define functional requirements which can help focusing general rules development for bibliographic description. According to Pisanski and Žumer (2010), the first opportunity for a tangible look at the structure of bibliographic universe (bibliographic entities and relationships between them) was when the Functional Requirements for Bibliographic Records (FRBR) conceptual model was founded in 1998. Pisanski and Žumer (2010) conducted a study to examine whether FRBR actually works and if it is user-focused, the study concluded that first indications imply that they are intuitive to users, however, FRBR's impact on cataloguing practice has not been extensively explored, and its practical implementation and costs are quite vague. This certainly requires further user-evaluation studies.

To enhance cataloguing and to build a better future for the online library catalogue, Markey (2007) stresses the importance of involving all interested parties in the decision-making process, including the technology. She also believes that there is a need to redesign the Online Library Catalogue by embracing the following:

- Post-Boolean probabilistic searching, to provide precise searching in the catalogue bearing full texts of digital books, articles, etc...
- Subject cataloguing, to make users recognize what they want or don't want during the process of search.

- Qualification cataloguing, to customize retrievals in keeping with users' level of understanding and expertise in a special field.

In summary, the following table presents a timeline for the development of cataloguing:

<b>Time in years</b>	<b>Main developments in cataloguing</b>
Early 19th century	Initial cataloguing rules: linear presentation such as printed book catalogues or in alphabetical card catalogues
1901	Library of Congress produced printed cards → led to activity of sharing
1908	The American Library Association (ALA) Cataloguing Rules were issued
1949	ALA revised as the Rules for Descriptive Cataloguing
1967	The publication of the AACR1 (Anglo-American Cataloguing Rules)
1978	The publication of the AACR2
1960s	Movement from traditional to automated cataloguing, catalogue entries became MACHine-Readable records
1970s	Computerized library catalogues started to appear, MARC records became the entries in the computerized catalogues
1990s	Revolution of the World Wide Web. Card catalogue in a database format (Online Public Access Catalogue) became the dominant library catalogue at that time
2000s	Era of digitization. The Online Library

	Catalogue has many competitors
--	--------------------------------

**Table 7.1 Timeline table for the development of cataloguing**

### **7.3 Classification definition**

If one consults a dictionary trying to look for the meaning of the word “classify”, the usual definition talks about arranging in classes or categories. Classification of books in a library is the process of applying such meaning, obviously, with adhering to certain criteria. Wasserman and Polk (2006) state that all materials in a library are arranged by subject, that is all items on a specific subject are placed together on the shelf having a classification number as an address to find the item. Classification schemes usually use numbers but may also use letters. Sometimes, more than one book can be found with the same classification number, they can be differentiated using Cutter letters that follow the number, which are usually the first three letters of the author’s last name. There are two most popular classification systems used within libraries are the Library of Congress and the Dewey Decimal System. As classifications are not the main topic of research, only a brief introduction about each scheme of knowledge organization is provided.

According to Wasserman and Polk (2006), Dewey was invented in 1876 by Melvil Dewey. It classifies the human knowledge into ten categories, as can be seen in the following table, and then further subdivided after the decimal point.

<b>Human knowledge</b>
000 Generalities
100 Philosophy and Psychology
200 Religion
300 Social Sciences
400 Language
500 Natural Sciences and mathematics
600 Technology (Applied sciences)
700 Arts
800 Literature
900 Geography and History

**Table 7.2 Categories of Dewey's classification system**

Library of congress system however classifies materials into twenty one branches of knowledge labeled from A to Z excluding I, O, W, X and Y. These categories are then further subdivided by adding one or two more letters and then a set of numbers. Library of Congress system suits bigger libraries better. Following is a list of knowledge branches as introduced by Library of Congress classification system:

**A:** General works

**B:** Philosophy, Psychology, Religion

**C:** Auxiliary Sciences of History

**D:** History, Countries not in America

**E:** America and United States

**F:** US Local, Other Countries in Americas

**G:** Geography, Anthropology, Recreation

**H:** Social Sciences, Business

**J:** Political Sciences

**K:** Law

**L:** Education

**M:** Music

**N:** Fine Art

**P:** Language and Literature

**Q:** Math, Science, Computer Science

**R:** Medicine

**S:** Agriculture

**T:** Technology, Engineering

**U:** Military Science

**V:** Naval Science

**Z:** Bibliographies, Library Science, Information Sciences (general)

Going back to Hoerman's (2002) statement in section 7.2, which stresses the importance of meeting local needs, this can also be applied to classification, as other classification systems have emerged to handle special areas of knowledge and resources. For example, there is the Weine Classification Scheme for Judaica libraries, which was developed because neither the Library of Congress classification system nor Dewey system met the standards of such libraries (Wasserman and Polk, 2006).

## ***7.4 Cataloguing and classification in JO1***

The next Role Activity Diagram represents cataloguing and classification process in JO1. The process starts with the acquisitions team sending materials to the cataloguing and classification team, who are experienced in

this work, the team includes the head of department, three members of staff who deal with Arabic books, one member of staff dealing with all other books in foreign languages and one responsible for auditing, following up and getting the books on the shelves. The roles participating in this process are:

**Acquisitions:** they do not have a major role in this process but they initiate it when they send the material to be catalogued and classified to the cataloguing and classification team after they've given it an initial record.

**Cataloguing and classification team:** includes six people. They create the catalogues and do the actual classification. There is the head of department, three members of staff doing classification and cataloguing for Arabic books, one doing the English ones, and another person – auditor – who double checks what has been done to make sure no mistakes were made.

The following RAD represents the process of cataloguing and classification in JO1. It is a simple process that comprises two main roles; acquisitions and cataloguing and classification team. Acquisitions initiates the process when they create an initial record for the item purchased, they then send it to cataloguing and classification team. For Arabic books, the book is retrieved through its accession number, it is then catalogued using MARC (MACHine Readable Cataloguing), which is an automated coding system where data is input. (Please refer to section 7.2 for more information about MARC). Getting the right catalogue information could also be obtained from the Arabic Union Catalogue which is a big cooperative electronic library between a number of Arab universities that provide book records. It does not provide any classification information, however.

If the item is a non-Arabic book, the member of staff responsible for foreign books checks the database. If the book exists, the record is verified, if the book is not there, a record is imported. If it is there but with a different edition the record is updated and considered a new record. After that the item is classified using Dewey and sent to the auditor. The auditor checks the process, if there is something wrong, the item is sent back to go through the process again. If everything is correct, however, the item is sent for spine print and security check, and it is then placed on the shelves.

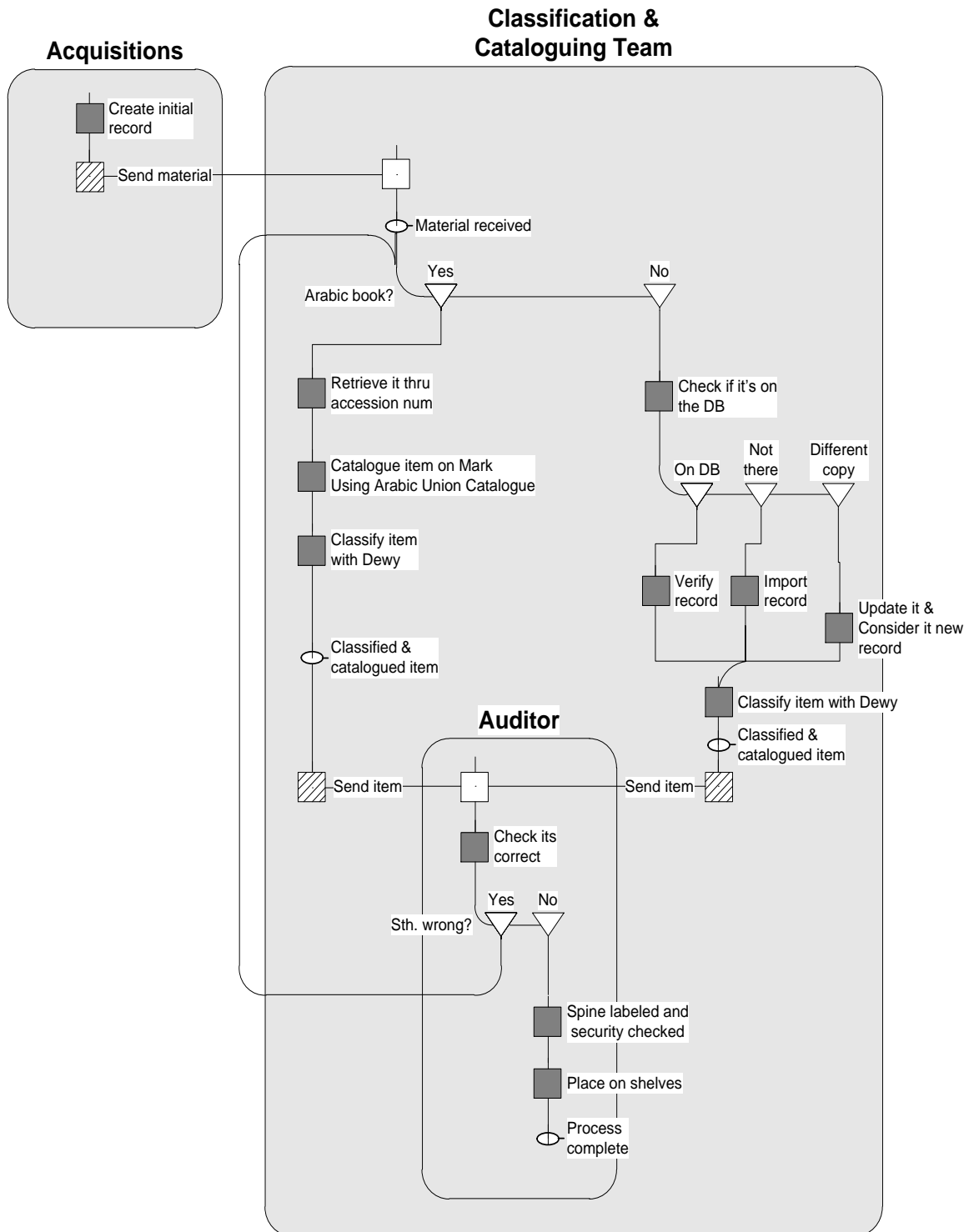


Figure 7.1 RAD for cataloging and classification process for JO1



### 7.4.1 Associated challenges

Things have improved in JO1 in terms of cataloguing and classification, with the installation of the new system “Horizon”. The head of the Technical Division - cataloguing and classification department - states: “to be honest problems became less after installing this system, even conflicting or repeated accession numbers are uncovered now”.

Being one of the largest academic libraries in Jordan, JO1 does not seem to have much trouble in terms of acquisitions, however, some library staff had concerns about work load. For example, the head of the technical division thinks that the library should have more staff involved, because there is a great amount of work when it comes to cataloguing and classifying items, specially theses, as JO1 is the Deposit Centre of theses in the Arab World. One member of staff in the team also states that work pressure is a challenge, especially in seasons such as exhibitions or binding periods, or when gifts are received at once in large amounts.

## 7.5 *Cataloguing and classification in JO2*

The next Role Activity Diagram represents cataloguing and classification process in JO2. The process starts with acquisitions for initial record creation then materials are passed to cataloguing and classification team. The roles participating in this process are:

**Acquisitions:** just as in JO1, acquisitions do not have a major role in this process but they initiate it when they send the material to be catalogued and classified to the cataloguing and classification team after they have given it an initial record on the system.

**Cataloguing and classification team:** comprises two members of staff.

The activities and their order are slightly different in JO2 than in JO1. The process starts with acquisitions creating an initial record for the received book, this process includes searching on the database for the title. If found, the title

is updated, if not found, then new record is created for the book, and details are entered on the system. They also write accession numbers on books (first page of the book). After that, books are sent to the cataloguing and classification team, which comprises two people.

They would check if there is a copy of the book in the library already, if yes, the new copy of the book is added with a new barcode, if the book is new however, and has not got any existing copies, it is catalogued and classified from scratch. Classification is done using Dewey. Information is entered on the system and also filled in on what is called a cataloguing sheet. The head of Cataloguing and Classification team states: "I fill in this sheet with all related information like the accession number, book title... and then I enter the classification details on the system and allocate a classification number". The book is then labelled with the accession number (the sequential number on the system which refers to how many books the library has got) and placed on the shelves, by the library assistant in the team.

With a much smaller library, JO2 does not seem to have problems related to cataloguing and classification. The process is quite straightforward and the staff responsible seem to be satisfied with the work load.

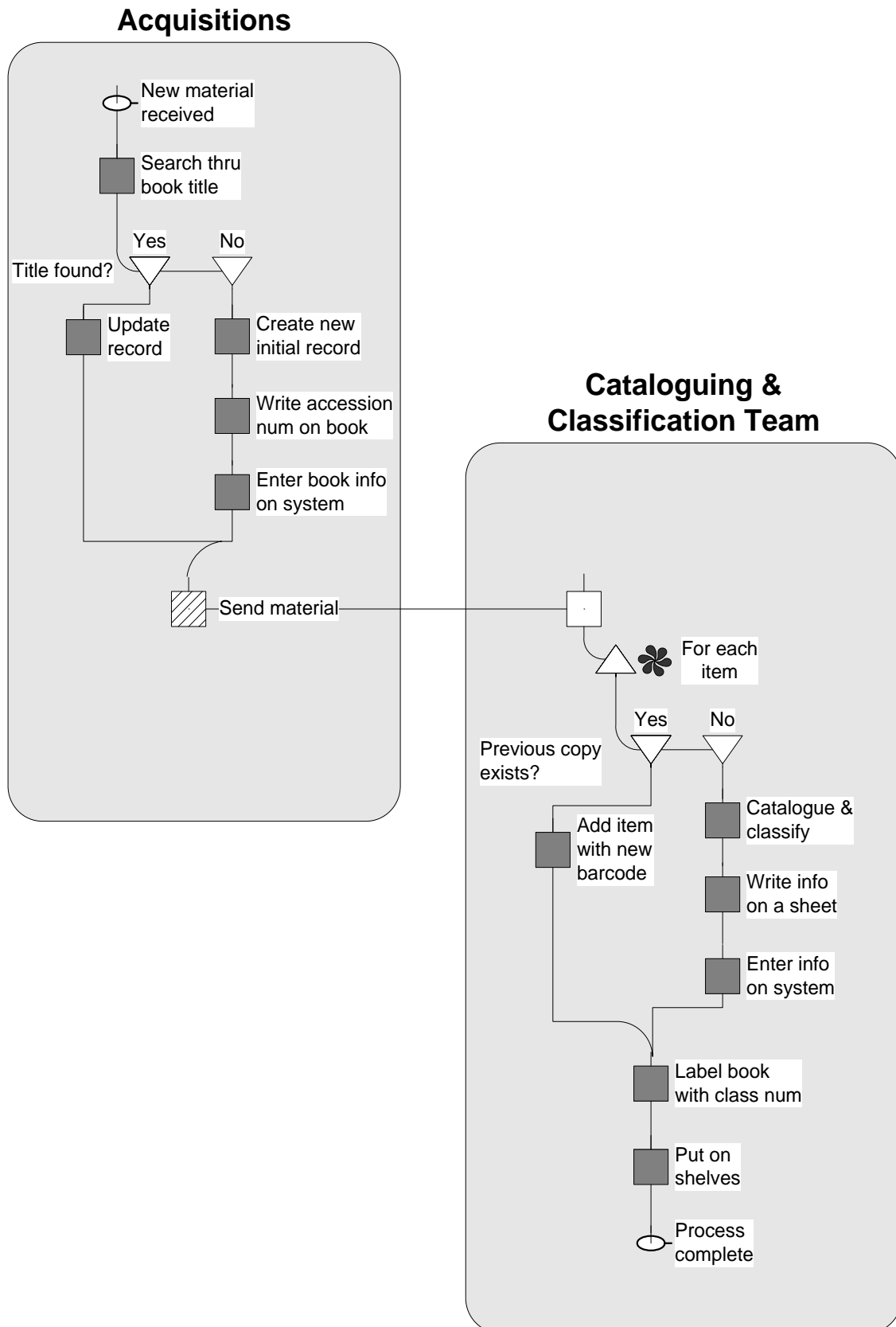


Figure 7.2 RAD for cataloging and classification process for JO2

## **7.6 Cataloguing and classification in UK1**

As can be seen in figure 7.3, more roles participate in this process in UK1. Tasks are divided between more members of staff. The roles in this process are defined as followed:

**Acquisitions:** as in the previous diagrams, acquisitions do not get involved in the process itself, they just create an initial record and send materials to the cataloguing and classification team.

**Cataloguing assistant and subject librarian:** two separate roles who cooperate together to create the right record and the classification number. The cataloguing and classification team leader is a subject librarian responsible for all the literature and history books, she does cataloguing and classification for those materials and at the same time she is the head of the team. The cataloguing team in UK1 comprises two and a half people, that is two full time librarians including the team leader, and one part time librarian.

**Processing:** to provide labelling and stamps.

**Issue desk:** member of staff on the issue desk changes the status of the book on the system when it is ready.

Acquisitions start the process by assigning a barcode, accession number and an initial record to the item. They then transfer it to a cataloguing assistant who would check the record. Sometimes acquisitions would assign a good context-specific record and a class mark as well, in this case, the catalogue assistant would just verify and send it to processing. However, if the record assigned was poor or there was no class mark, the cataloguing assistant would then pass it through to a subject librarian, who would improve the record and assign a class mark to the item. The item is then sent for processing.

The role 'processing' is called so according to the member of staff interviewed. The responsibility of this role is to label and stamp the item, and

spine label it. The item is then sent to the issue desk, where the item's status is changed on the system.

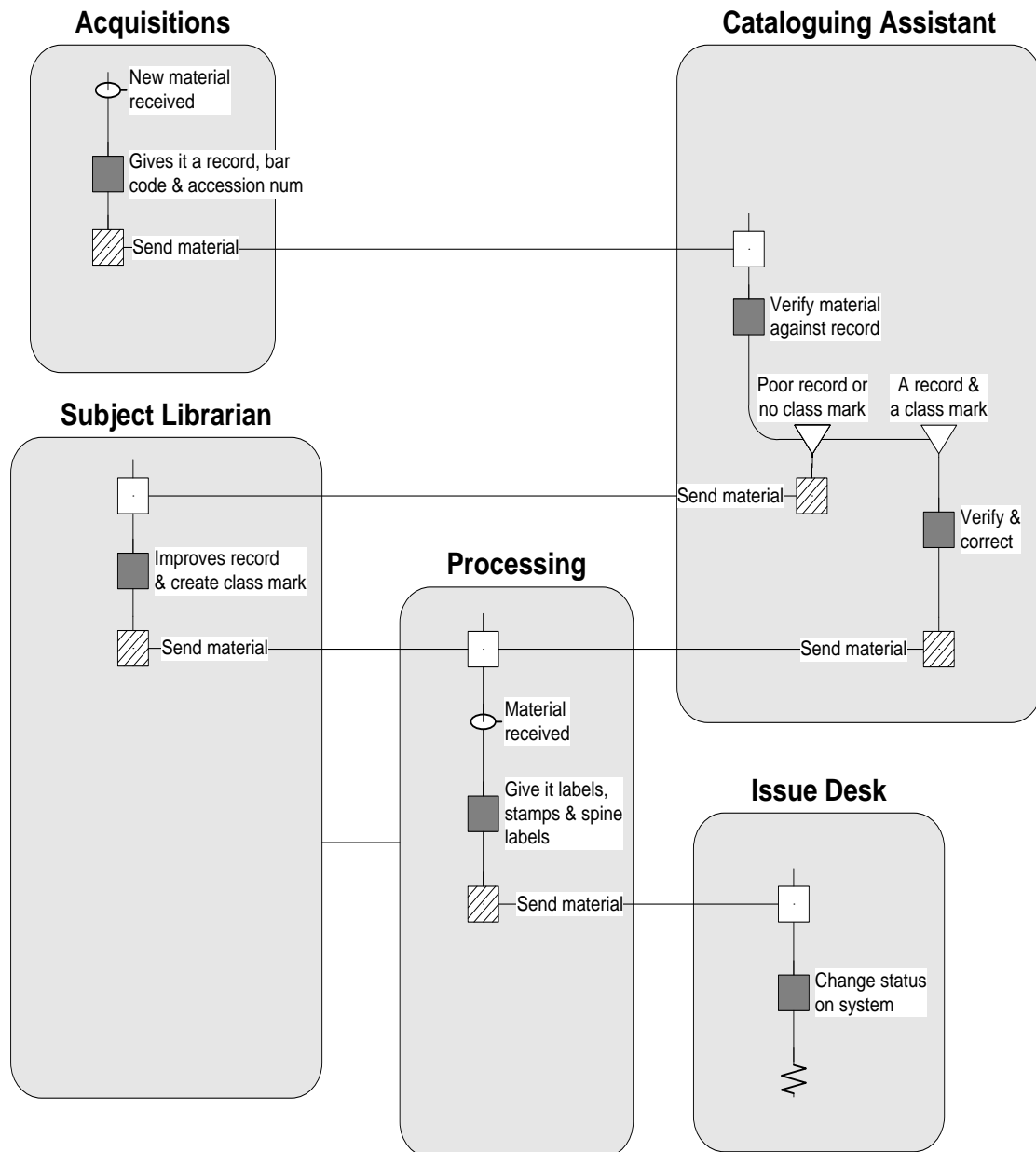


Figure 7.3 RAD for cataloging and classification process for UK1

### 7.6.1 Associated challenges

There are some challenges associated with this process. First of all, as mentioned earlier in section 6.5.1, the two campuses within the university need to be merged, this merger means that the two libraries will be integrated within two to three years. Consequently, there will be a need for reclassification of stock. According to the Assistant Director in UK1, there is the problem of using different classification systems in the two campuses, he states:

*We are Dewey here and it's Library of Congress over there, we've never had the chance to reclassify it, and actually it is even more complicated than that because part of the Dewey decimal sequence is actually universal decimal which is different again... we're starting now and we've got two to three years left before things start to move and I think we'll get a fair bit done but I can't see everything done, we think we'll be moving summer 2011, we think... so it seems a long way maybe but in terms of reclassifying stock and getting rid of a lot of stock and be ready to shift everything including fabric, so we're preparing to move.*

The Bibliographic Services team leader also referred to this challenge, the complex coding system. UK1 is now re-cataloguing items in a library that has been merged recently into UK1, the number of books are about eight to nine thousand, in addition to a collection of music from the nineteenth century that used to be in a country house in the area. The Bibliographic Services team leader added: "a lot of material was catalogued on cards, but now we don't keep cards. Some of that material became uncatalogued after using the computer information system".

There is some kind of prioritization when it comes to item classification, those books with pink slips are done first, then books with yellow slips, then there is everything else. Books with yellow slips mean they have been classified (there are some copies in the library already), so they don't usually take much time. As a result, pink slips have to be done first, a member of staff in the bibliographic services team comments on this: "if there are any pinks they've got to be done, I've got some lecturers, I think they realize we do this first and mark all their orders, but I'll probably do the same!"

When a member of staff is off for a while, they come back to a great backlog, as there are not enough people to do this job. One member of staff in the bibliographic services team says: “I’ve been off for two weeks, although the pinks I know have been done... it does mean that I have a hell of backlog, there’s no one that can slip into my role”. The head of the team referred to this problem: “our problem is the enormous amount of work, and very few people to do it (two and a half)... time pressure”

Another more general consideration for classification and cataloguing is that university libraries in the UK may be moving towards combined catalogue and database searching. At UK1, for example, there is a service that offers a single fast search across the catalogue (books, mostly) and ten databases. This could probably be further improved to include more titles and more advanced searching facilities.

## ***7.7 Cataloguing and classification in UK2***

The next diagram (figure 7.4) demonstrates the process of cataloguing and classification in UK2. As mentioned earlier in section 3.6.2, the researcher could not meet the person responsible for this process at the time of interviews, so a separate interview was arranged by email later. The participating roles in this process are:

**Acquisitions:** As mentioned earlier in section 6.11, acquisitions team in UK2 comprises two members of staff, one responsible for the ordering and another person who receives the books. The member of staff involved in this process is the one who receives the ordering.

**Information specialist (subject librarian):** as mentioned in chapter 4, the library structure for UK2 is quite different than the others. Cataloguing and classification is not a team as such, the members of staff who do this work are called information specialists. So the role name here is different but they do essentially the same job that ends up with cataloguing and classifying an item. So the subject librarian in UK1 is separate from the cataloguing team, while in

UK2, the information specialist could be a subject librarian, who is involved in cataloguing and classification.

**Processing:** to provide labels and stamps, this is done by Bibliographic Support team (library assistant). However, this position is currently vacant in UK2 (summer 2010), so it is being done by a student shelve.

The process starts with acquisitions. The member of staff who receives the books downloads or creates a record and attaches it to the order (electronically on the system). Acquisitions then checks if a barcode was attached by the provider, if not, it is then attached. The dummy item number is then replaced with the barcode, and book's status is amended. The item is then passed for cataloguing. The information specialist would edit the book record; major changes might be needed if a record was not downloaded. Item would then be classified with Universal Decimal Cataloguing number, and passed on for processing.

Once books get spine labels and stamps, their status is then amended again and the item is placed on the shelf by a student shelve or library assistant according to shelving rota as this position was vacant at the time of conducting the interviews. The item is issued to 'new items' display unless it is just an extra copy, in this case it is just shelved.



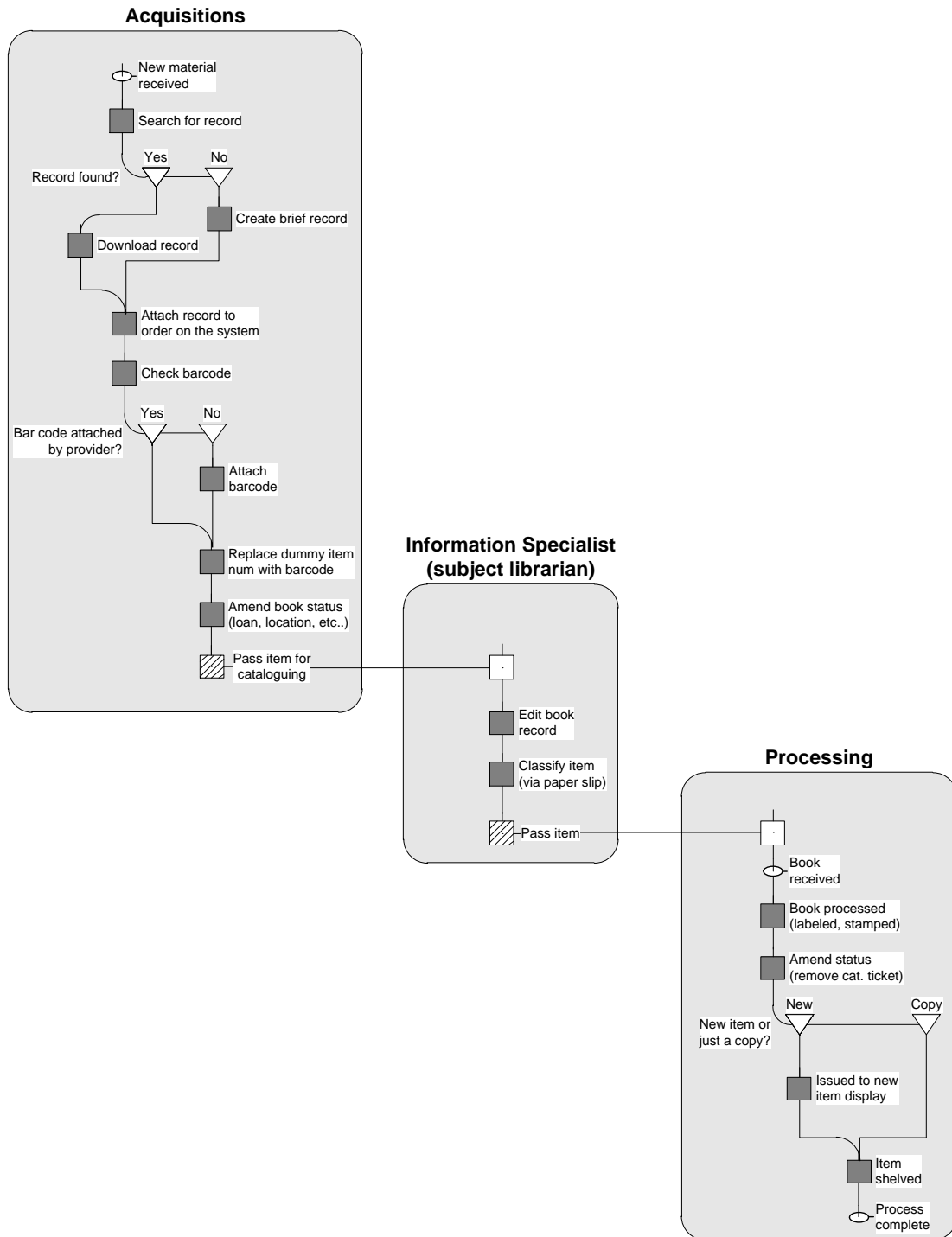


Figure 7.4 RAD for cataloging and classification process for UK2

### **7.7.1 Associated challenges**

The cataloguing and classification process in UK2 is quite straight-forward. One information advisor however criticized the small number of computers specified for catalogue search, as these are only three in number.

## **7.8 Discussion and results**

According to Hunt (2010), little or no published research is conducted to apply techniques to cataloguing workflow. As noted in section 7.2, he suggested a process map to consider activities at process level. Hunt points out that library staff (excluding managers) are more aware of current practice than managers since management is often too focused on future vision.

In this research, RAD was used as a tool to visualize and analyse processes. It was applied in this chapter to model the process of cataloguing and classification in the four selected libraries. The process is simpler than acquisition and comprises fewer actions. The main concern was the enormous amount of work with few members of staff doing it. It was also noticed that although automated cataloguing and classification systems were developed, some libraries still use paper work to complete the process. Following are results revealed from the RADs provided, these results are listed according to the four different styles of improvements suggested by Ould (1995):

#### **1) Point-wise improvements:**

- Using better tools to enhance the process and to reduce paper work. In JO2, it was learnt from the head of cataloguing and classification that all related information is filled on a paper then entered again on the system. When she was asked why they were still using paper work for this, she answered: "It's been the way of doing things". Although staff in JO2 know that there is no need for this, they still use it and it does not seem that they intend to improve the process, the head of the team states: "we still use this sheet, although many university libraries

stopped doing that". This particular point asserts the demand for change in the culture and mentality of library staff. This gives an indication about the culture, the shared meaning and the conformation to the same set of rules. It also emphasizes the need for change, not only for the services provided; but also for library staff thinking and the processes they undertake. Another example of using paper work is the use of paper slips in UK2 by the information advisor.

- As time and deadlines form a good feature in RAD, more precision can be added to the diagrams by clarifying any deadlines, such as determining the time scale for leaving the new items on the 'new items' shelves in figure 7.4.

## 2) Improvements by restructuring roles:

- Work load on some roles. There is a difference between UK and Jordanian libraries selected in terms of work distribution between the roles in cataloguing and classification process. Figures 7.3 and 7.4 show that work is divided fairly between the assigned roles, while in figures 7.1 and 7.2 there is a big load on the cataloguing and classification team. The head of the technical division in JO1 supports this as she thinks that the library should have more staff involved, because there is heavy workload for cataloguing and classifying items, especially theses (another solution could be adding a separate role for processing activities, please refer to the second point under realigning the organisation to the process). Although work is quite fairly distributed between roles in UK1 (figure 7.3), there is still demand for more staff in, the reason for that is the current situation where the two campuses within the university need to be merged, which means that the two libraries will be integrated. The problem is temporary and it resides in reclassifying the stock as two different classification systems are used in the two campuses, as mentioned in section 7.6.1.

## 3) Realigning the organisation to the process:

- Adding more activities within roles. Figures 7.1 and 7.2 do not pay attention to showing book status on the system. Compared to figures 7.3 and 7.4 where an activity like “amend status” is included in the models. This considered a difference point between UK and Jordanian libraries.
- Adding roles and deleting existing ones. Looking at JO1 and JO2, they both limit the process between two distinct roles; acquisitions, and cataloguing and classification team, the latter includes processing. In the UK university libraries however, the role ‘subject librarian’ gets involved in the cataloguing and classification process and there is a separate role for processing. In UK1 for instance, subject librarians are involved in the process to make sure books are classified precisely, so they work in conjunction with members from the cataloguing team to produce the right class mark. Similarly, in UK2, an information specialist (who although is named differently, essentially does the same job) is assigned to provide bibliographic support. This collaboration and involvement of the subject librarian in the cataloguing and classification process might be effective since it provides precise cataloguing and classification. However, according to current practice as reflected in the library literature, there is a trend to focus subject librarians on other priorities rather than on traditional responsibilities. Although Pinfield (2001) believes that cataloguing and classification is one of the traditional responsibilities assigned to subject librarians, subsequent studies have confirmed that subject librarians are being involved in emerging priorities (such as selection of e-resources and information literacy), leaving traditional responsibilities allocated to other librarians:

*It is interesting to note that ‘traditional’ library skills, such as cataloguing and classification, feature very little in discussions about the role of the modern subject librarian (Hardy, 2005).*

To further support this argument, Feldmann (2006) stresses the need for subject librarians to adapt to the newly emerging library environment, by moving from performing traditional roles (such as being bibliographers) to engage in other responsibilities such as

collection development and guiding students to references. Agyen-Gyasi (2008) also refers to some of the important roles of subject librarians, such as: collection development, liaison with academic staff, selection of e-resources and information literacy education.

In conclusion, for the UK libraries, the recommendations are to reallocate cataloguing and classification activities to other members of staff rather than subject librarians, to enable them to focus on other priorities. Therefore, in UK1, the role 'subject librarian' can be removed and all its cataloguing and classification activities can be moved to the 'cataloguing assistant' role. In UK2 however, the 'subject librarian' role seems to be the bibliographer, and the recommendation is to separate the two roles, by allocating cataloguing and classification to a member of staff who is different from the subject librarian. So the role 'information specialist' can stay, but to do cataloguing and classification only. In the Jordanian libraries, processing activities can be moved to a separate role to reduce the work load on the cataloguing and classification team (this could be a solution for the work load problem mentioned in the previous point under improvements by restructuring roles).

Having the diagrams analysed and results for process improvements extracted, as mentioned in the previous chapter, there are some factors that affect the quantitative behaviour of the process (Ould, 1995), these are:

- The number of staff carrying out activities. As discussed previously in the results, interviews with cataloguing and classification staff from JO1 and UK1 revealed that there is a need for more staff to deliver a faster and more efficient process.
- Seasonal work – how intensity of activity varies during the year, a library assistant from the cataloguing and classification department complains from the work load in certain period of time when piles of books come in, such as exhibitions and binding periods, or when gifts are received in large amounts.

- The availability of tools and other resources needed in some roles. JO2 and UK2 should get rid of paper work as the system is automated.
- Economic and currency situation. As mentioned before some libraries need more staff in to help in the cataloguing and classification process, however, this factor could be an obstacle.

## **7.9 Chapter seven summary**

This chapter discussed the process of cataloguing and classification in the selected libraries. It started with an introduction, then an overview of cataloguing history and associated changes. It also introduced classification processes briefly. RADs were then provided for the process in each of the four selected cases. Results were extracted from the models to indicate some improvements for a more efficient process.

It was noted by Hunt (2010) that little research was conducted on cataloguing workflow. The RADs provided in this chapter were able to visualize the process of cataloguing and classification, they also revealed process improvements according to Ould's four styles of improvements. The improvements suggested allowed comparison between the cases selected as follows:

- A big work load on cataloguing and classification teams in JO1 and JO2, while in UK1 and UK2, work is divided fairly between the roles. However, although work is quite fairly distributed between roles in UK1, there is still demand for more staff, the reason for that is the current situation where the two campuses within the university need to be merged, which means that the two libraries will be integrated. The problem is temporary and it resides in reclassifying the stock as two different classification systems are used in the two campuses.
- The second difference lies in having a feature on the system that shows the item's status. JO1 and JO2 do not pay attention to that while

it is considered in UK1 and UK2 by having, for example, an activity called “amend status”

Other general improvements included using better tools to enhance the process and reduce paper work, and adding a role of a subject librarian – such as the one in UK1 – to produce the right class mark.

## **8 Chapter Eight: Binding, Digitization and Theses Handling Processes**

### **8.1 Introduction**

In chapters six and seven, basic university library processes were discussed and modelled: these were acquisitions, and cataloguing and classification. This chapter looks at other processes that take place in the selected university libraries but at different levels of emphasis, in other words, they do not all receive the same priority currently. The processes to be modelled in this chapter are related to binding, digitization and theses handling.

### **8.2 Binding in JO1**

Book binding allows pages of a book to be bound together permanently. It protects materials from getting damaged. Book binding is important when dealing with rare books or special collections, and so organisations and libraries embracing such collections are interested in book binding. Protecting books is not the only advantage for binding, as a study conducted by Chen and Chen (2009) shows that book cover design is a very important factor for attracting users' attention and raising books' purchase level.

For this research, it was learnt from the interviews that JO1 is the only university library among the cases selected that deals with book binding as a separate complete process involving various stages, and which takes place annually. While every book gets bound in JO1, in the other university libraries binding does not exist as such. It happens occasionally. In UK1 for instance, issues of periodicals get bound when they complete a volume. This saves shelf space, and ensures separate issues are kept together. In UK2, books get bound only if they are damaged. In JO2 however, books get bound if they do not come in with hard covers. Binding in this case provides greater longevity for the books, particularly those that get heavy use.



In this Jordanian university library (JO1), binding is considered one of the important processes that take place in the organisation. The binding and repairing department is part of the library services division as can be seen in figure 4.1. A bid is announced every year for interested parties to handle this process. The head of binding and repairing department states:

*Each year we announce a bid from the bids division in the university, it invites binding companies, through an advertisement in the newspaper and on the university's website- to take over binding for our library's material, and the budget is twenty thousand Jordanian Dinars yearly.*

This means that binding is outsourced. Section 9.4 discusses some of the implications of outsourcing.

The next model represents the process of choosing a contractor to take over the project. The roles involved in this process are:

**Binding and repairing department:** located within the library and responsible for preparing the binding bid with specific requirements, they also follow up the material with the chosen company and update books' status on the system.

**Interested contractor:** the company that satisfies the specifications of the project and delivers the bound books later as agreed.

**The bids division:** it is a separate division located within the university campus and responsible for announcing all sorts of projects needed for the university in general. There is a committee within this division comprising thirteen members of staff from the library responsible for bids related to the library.

The following RAD describes the process of book binding in JO1. The process starts with the start of the academic year when the bids division announce a bid in newspapers and on the university website to invite interested parties for this project. Interested contractors would then buy a copy of the detailed specifications and requirements of the bid and prepare an offer. The offer includes information such as the type of item to be bound (maps, letters, periodicals, books, etc...) and its description such as the size, along with its

binding price. The price list is sent to the bids division. When all offers are received – which usually happens within a set period of time, say ten days for example – the bids division staff study these offers and look at those which meet the required requirements, and then choose the one with the best price.

The chosen contractor is then invited to sign and keep a copy of the contract knowing that they would need to pay 10% of the value as a guarantee, this cheque payment is held till the end of the contract and when items are bound and received. The role of binding and repairing department in the library starts here, when the contract is sent to them to prepare the lists of items. Each list could contain one hundred books for example, and more than one list is usually prepared, with each allocated a number. The library would call the contractor to pick up the items and to sign and keep a copy of receipts to prove items were received, and the library keeps another copy of the receipt as well.

When the deadline for receiving the items is due, say after thirty days for example, the books are usually back, staff in the binding department would check them to make sure they are in the same condition and bound as requested. Finally, the item's status is then changed on the system from "Bind" to "Cat".

In the case that items to be bound were not received on time, or received in different condition, the binding department would write a formal letter stating that items were not received on time, and a charge of 5% would apply accordingly for each late day, knowing that there is an extension of five days above the agreed deadline. According to the head of the binding and repairing department, this rarely happens, and if it does, charges cannot exceed 50%.

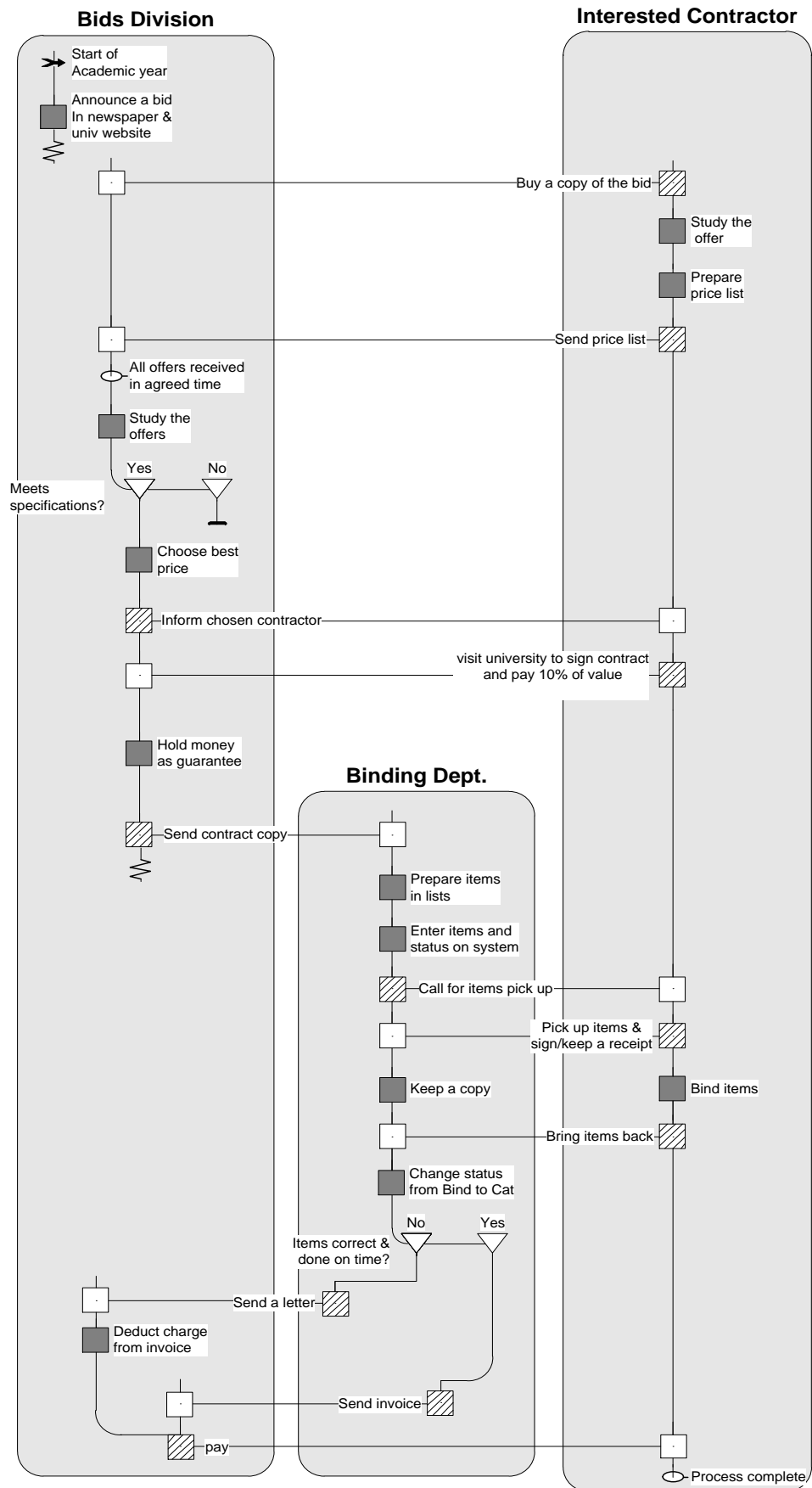


Figure 8.1 RAD for book binding process for JO1

### **8.2.1 Associated challenges**

As mentioned before, binding takes place after acquisitions, but not all items get bound, the head of Technical Division – cataloguing and classification department states that most of the items that get bound are of Arabic books. So, usually, after acquisitions, materials either go to binding then classification or go straight to classification if they do not need to be bound.

According to the head of binding and repairing department in JO1, the main challenge related to binding process is improving the system and developing new enhanced features. The current system provides few options which are limited to the following: make an inquiry; send for binding; receive from binder; and receive one specific batch. There is also the option of changing the contractor details. The system deals with lists (batches) only, it does not accept individual items, and so individual books that need to be bound urgently for example cannot be processed.

Binding affects classification, as having batches of books bound at once means that there will be pressure on cataloguing and classification. As mentioned before in section 7.4.1, a library assistant in the cataloguing and classification team stated when she was asked about challenges faced: “work pressure really, there is much work to do, especially in special seasons, like exhibitions periods, or binding periods...”

### **8.3 Binding in JO2**

Things are different in the other Jordanian university library. Binding does not exist as a separate process, and it happens occasionally. When the head of classification and cataloguing team was asked about binding and whether each book gets bound or not, she answered:

*Not always if the book is, you know if it comes with a hard cover then it's ready to be placed on the shelves after I label the classification number on it, so there is no need to bind that. However; if the cover is not hard enough then I send it for binding.*

When the head of acquisitions was interviewed, however, she said that every item should be bound. As this caused some confusion at the analysis stage, I revisited the site to clear things up, and I learnt that binding is a minor process, as JO2 binds only books with soft covers. The assistant director stated that 90% of Arabic books are received bound with hard covers anyway, and she added: “binding is rarely done here that’s why we don’t have a binding department”. For those books that need to be bound, the university deals with an outsourced binder on a contract basis, to be renewed annually, depending on the suitability of the price. Periodicals also get bound, it varies when though. For example, those issued monthly get bound annually at the end of the year. Although interviewees in JO2 did not show much attention to binding as a process, it is represented in the next RAD.

Figure 8.2 illustrates the binding process in JO2, which is much simpler than the process in JO1 in terms of roles, activities and also the number of items to be bound. There is no separate department for binding within the university. In those rare occasions when a book or a collection of periodicals needs to be bound, the library contacts the binding company they deal with. There is an agreed fixed price for binding books and periodicals. In this case, the binder would bind the items and label their classification numbers on them. Members of staff responsible for the library halls receive the books and place them on the right shelves. The roles participating in this process are:

**Cataloguing and classification team:** comprises two members of staff.

**Binding company:** outsourced specialized company in binding. There is agreed fixed price for binding books and periodicals.

**Finance:** responsible for making payments.

**Halls supervisor:** to place items on their right location on shelves.

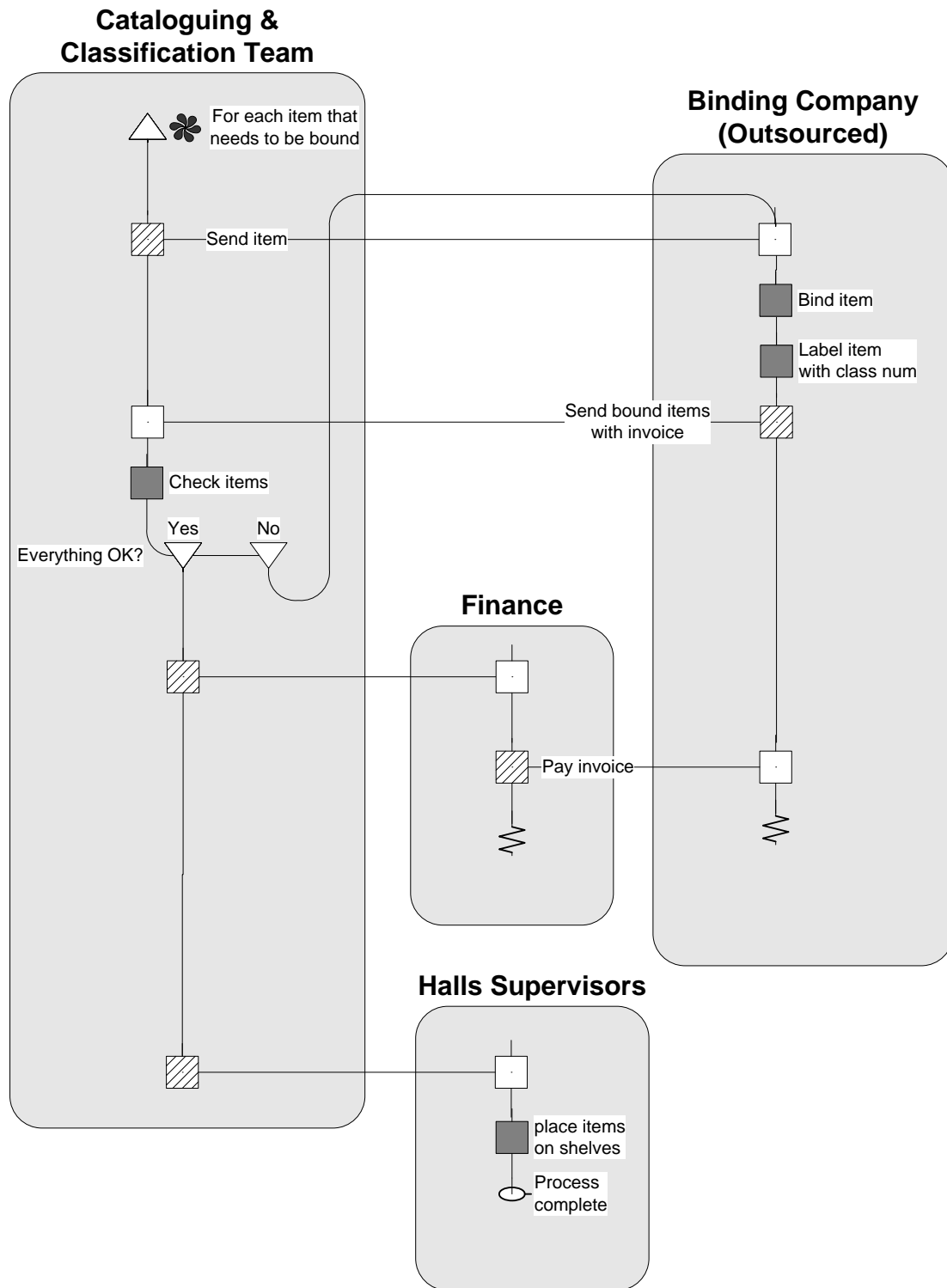


Figure 8.2 RAD for binding process in JO2

## **8.4 *Binding in UK1***

In this university library binding does not exist as such, however, it was concluded from the interview with a member of staff on the enquiry desk - from support services - that when periodicals arrive and form full volumes they would then get bound: "I'll put them out on the current stands and they stay there until the next issue comes in, most of them come sit on the shelves here until we have a full volume and then we bind them".

## **8.5 *Binding in UK2***

As in UK1, binding does not exist as such in UK2. In fact, theses and damaged books are the only things the library would be interested in binding, as stated by a member of staff in acquisitions: "well the only thing that gets bound as far as I am aware is theses or anything that is been damaged and we decided to do, so book binding as such does not exist".

## **8.6 *Digitization***

"Digitization is a hot topic", as stated by the collection management team leader in UK1 library. Academic and research libraries have become increasingly interested in using electronic information and resources on the internet, and they have therefore become involved in changing their material format from print into digital content. Hughes (2004) defines digitization as "the conversion of an analogue artefact into a binary representation". Digitization has become a big business nowadays. Most museums, large libraries, and organisations are currently at some stage of making their materials available in the digital form (Hughes, 2004).

Digitization projects are a relatively new endeavour for most libraries (Mugridge, 2006). There has been a challenge in creating digital material and also in digitizing current print materials. According to Sutherland (2008), many

digitization projects have been initiated, alongside predictions about the value added when many of the world's old materials become available online. Although digitization requires attention to copyright issues, Purcell (2009) believes that digitization offers great opportunities to researchers to look at archives and historical records.

According to Sutherland (2008), digitization can be at different levels. It can start with capturing images of book pages using scanner or digital camera, which is similar to storing books on microfilm except that the digital form allows more functionality, or it can be improved to include Optical Character Recognition (OCR) which is used by Google to search easily through page images, and finally, there is an advanced phase of digitization called semantic coding, which can identify whether a particular instance of a word, say for example "Petra" refers to a person or a city.

Digitization has achieved some promising developments in some organisations, however, as it provides a way of preserving library collections and an easy way to access resources for a large number of users at one time, but there are still some challenges related to using this technology. Mugridge (2006) states that digitization has a significant impact on libraries' budgets, organisational structure and staffing. Moreover, digitization activities require funding, and collection development to provide broad access to resources. More challenges mentioned by Byamugisha (2010) are:

- Interoperability: which is achieved when various digital libraries intellectually interact, the challenge however is to have a common set of protocols and standards.
- Knowledge organisation systems, users and usability: this refers to the range of tools used to retrieve knowledge, and to the various methodologies and data collection techniques.
- Legal, organisational and social issues: intellectual property and copyright issues have been considered a challenge too.
- Staff education: competency and expertise is certainly needed in managing and preserving digital collections. Ngulube (2004) emphasises that rapid changes in information management



technologies and the challenges of collections preservation require constant development of knowledge and skills.

- Language barrier: presenting information in the language required by the reader is a challenge.

For cases under study, a RAD is only provided for UK1 as it was the only case where discussions about a complete digitization process could take place (as can be seen in section 8.6.2). Digitization projects are starting in JO1, where a few projects are currently under study, and these are described in section 8.6.1. However, digitization does not exist at all in JO2. For UK2, digitization has not been fully adopted, although they wish to implement it. The resources and facilities manager in UK2 states:

*We went through a project, a research project, we digitized a few, mainly reports but there is nothing else really that we digitized, we may want to – if there was objects and time - to digitize some of our old theses, but other than that I don't really think we've got time for that.*

According to the head of information services, the few reports digitized are collections that UK2 regard as important, these include: series of technical reports produced by the college of aeronautics, working papers produced by the school of management, technical reports produced by the aeronautical research council which are hard to find, and finally technical reports covering aerospace research which attract international interest.

Copyright permission is obtained in UK2 to do all the above but the real challenge is to seek and obtain permission to digitize high demand items such as textbooks for example.

Students' theses are becoming another source of digitized items. The head of information services in UK2 states: "there is a mandate on all students who have to provide electronic copies of their theses and we will on request digitize back copies of theses".

### 8.6.1 Digitization in JO1

The Archives and Microfilm department in JO1 comprises three members of staff including the head of department. According to the head of department, they have been using microfilms and microfiches as a way of keeping old materials and preserving them in good condition. Microfilms and microfiches are scanning services that enable organisations to preserve their material optically, which in turn provides a more portable and accessible format for businesses to use (Patterson, 2011). Examples of materials saved on microfilms and microfiches in JO1 are: manuscripts (there are around 2500 titles in various disciplines); important governmental documents; rare books; and municipality records. Another reason for using microfilms or microfiches is saving space, as much space is occupied by newspapers and magazines which go back to the nineteenth century. Microfilm reader-printers used in JO1 are a type of copier. Plesums (2007) explains the principle of these microfilms, which are now considered to be old since new technology that scans the film digitally emerged:

*The light shining through the film was used directly to make the printed copy. These reader-printers were large, slow, and mechanically complex (often out of adjustment). The only output was paper, so use of these machines to convert an image requires two steps - printing (conversion from film to paper), and scanning (conversion of paper to an electronic image). The two steps require extra time, labour, and supplies, and reduce quality by doing two image conversions.*

Two projects were successfully completed in JO1 based on special programmes and plans, where managerial, technical and financial resources were needed. The first one is related to storing old magazines on microfilms, the second one is storing all documents of legitimate spiritual courts aged five hundred years back, from the Ottoman period, and parliamentary documents since 1926. These are essential documents that hold the country's political and social story, and a very good source for interested researchers.

JO1 is working now on moving from microfilms and microfiches to digitization. There were three projects getting started at the time of conducting these research interviews. Just like the binding process in JO1, digitization projects are released through the bids division. The first bid is to hire an outsourcing

company to digitize newspapers which have not been entered on the system using microfilms. These are dated from 1962 onwards and they comprise about nine million pages. Funds were ready for this project and it is expected to take three years. The second project is purchasing special digitization machines to allow digitization in house. The third project in the long term is to convert all microfilms into electronic (digital) format from 1972 onwards, and, according to the head of archives department, this project might take up to five years.

### 8.6.2 Digitization in UK1

Digitization has existed in UK1 since 2006, but it is taking place in a limited way. The Assistant Director in UK1 stated when he was asked about digitization: “we are not as well ahead as some universities, so we might not be a good example”. According to him, the progress in UK1 in terms of digitization is very limited: “we digitize some core texts, articles, we get some from the British Library and according to academic needs. We are a very little way down the road”.

In spite of this limited deployment of digitization in UK1, it was learnt from the interview that there is a process related to digitization, how to request digitized materials and also how to decide where to order them from. As mentioned before in section 3.6.2, documentary information and archival records were examples of data collection methods used in this research. A flow chart of ‘ordering process’ for digitization was collected from lending services team, which helped – along with the interview – to explain the process.

The following RAD represents the process of a digitization request. The roles participating in this process are:

**Academics:** academic staff who wish to request digitization. They decide on materials to be digitized.

**Lending services team:** comprises four part time members and a team leader. Digitization is one part of their job, as they are involved in issue

counter, shelving duties, circulations and inquiry desk. Digitization was introduced in 2006.

**Subject librarian:** whose main job is to check whether a requested item is available electronically or not.

As can be seen in figure 8.3, academics start the process by placing a digitization request electronically. At the moment, academics' selection for materials to be digitized is the main selection criteria in UK1. It is important to have criteria for selecting resources to be digitized as digitization requires planning and high budgeting, as Brancolini (2000) attests:

*The costs associated with creating digital resources are significant. Planners must develop selection criteria and procedures in order to ensure that limited time and resources are committed to projects to digitize the most significant collections with the highest probability of successful completion.*

Martinez, Newsome and Sheble (1998), for example, selected the usefulness of the previously published material to the University of Arizona staff and students as the main factor for choosing materials to be digitized.

When an academic member of staff requests digitization in UK1, the request is received by the lending services team. It is worth mentioning that academic staff and lending services team communicate and exchange emails via an account called "clastaff" which has got all necessary folders and requests forms. The lending services team would then check that they have all required details on the module list, for example: module name and number, interested department, name of the lecturer authorizing the request and article details. If some information is missing the requester is notified to correct them, if everything is correct then a folder for the module is created on the clastaff account and all related emails are moved to that folder.

Lending services would then gain 'course builder' access on blackboard from the requester (lecturer) who is the only one who can authorize this access. Requests are then filed into a 'digitization requests' file and a template called 'digitization request form' is filled. It is important to go through a checklist at this time to be able to make a decision later about where to buy digitized

material from, or, more probably, to digitize it in-house. The points that need to be checked at this stage are:

- If the item is in stock
- If it is a US or a UK publication
- Make sure it does not appear on any of the exclusion lists on the CLA website
- No restrictions breached

The request is then passed to a subject librarian who checks whether the requested resource is available electronically or not. If it is available, then no digitization is needed, if not, the form is signed and returned back to the lending services team who file the form in a 'digitization request' folder. After making sure that the requester is aware of charges, the lending services team goes through the final checking to ensure that this material has not been digitized before, if not, they would proceed with digitization.

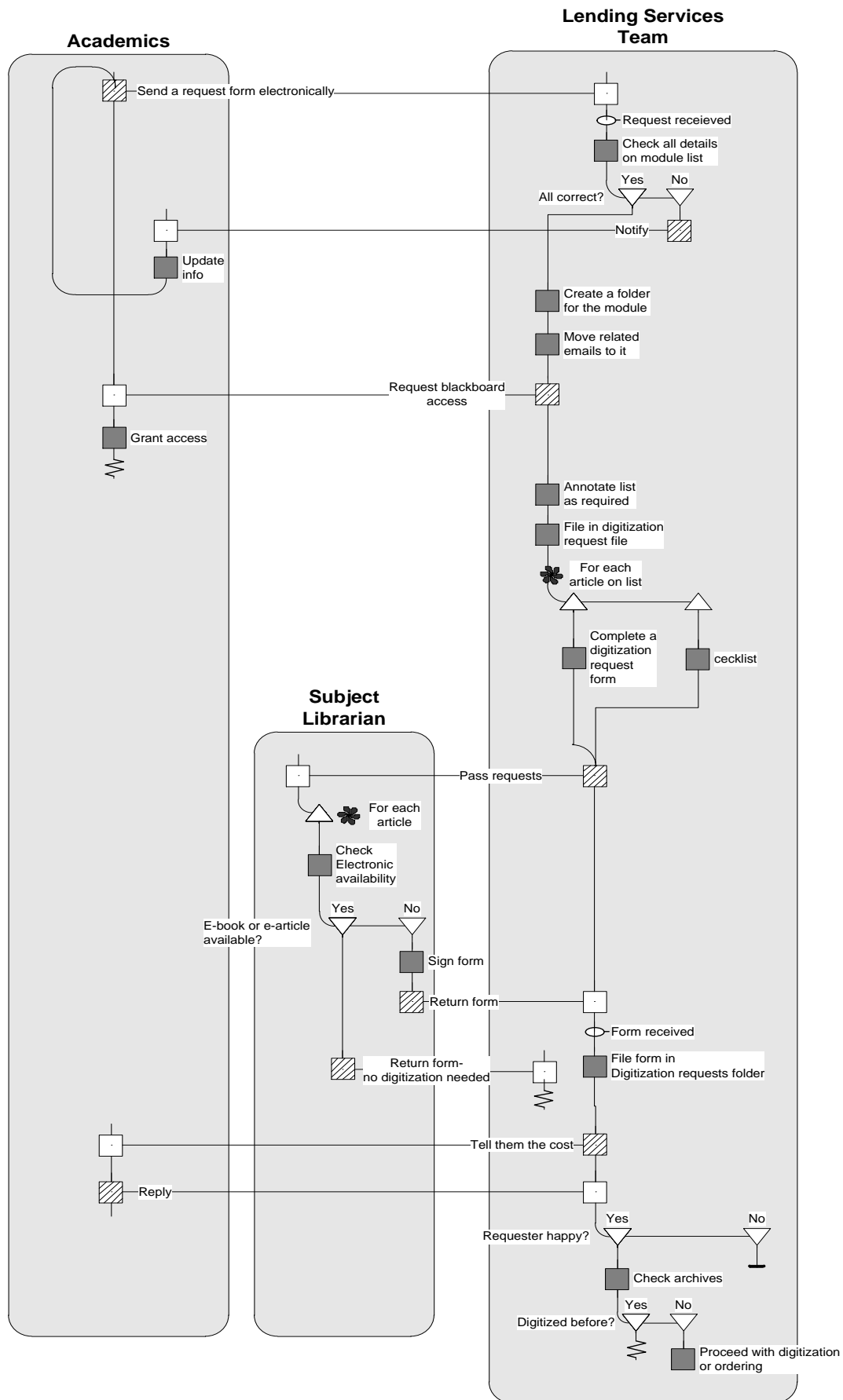
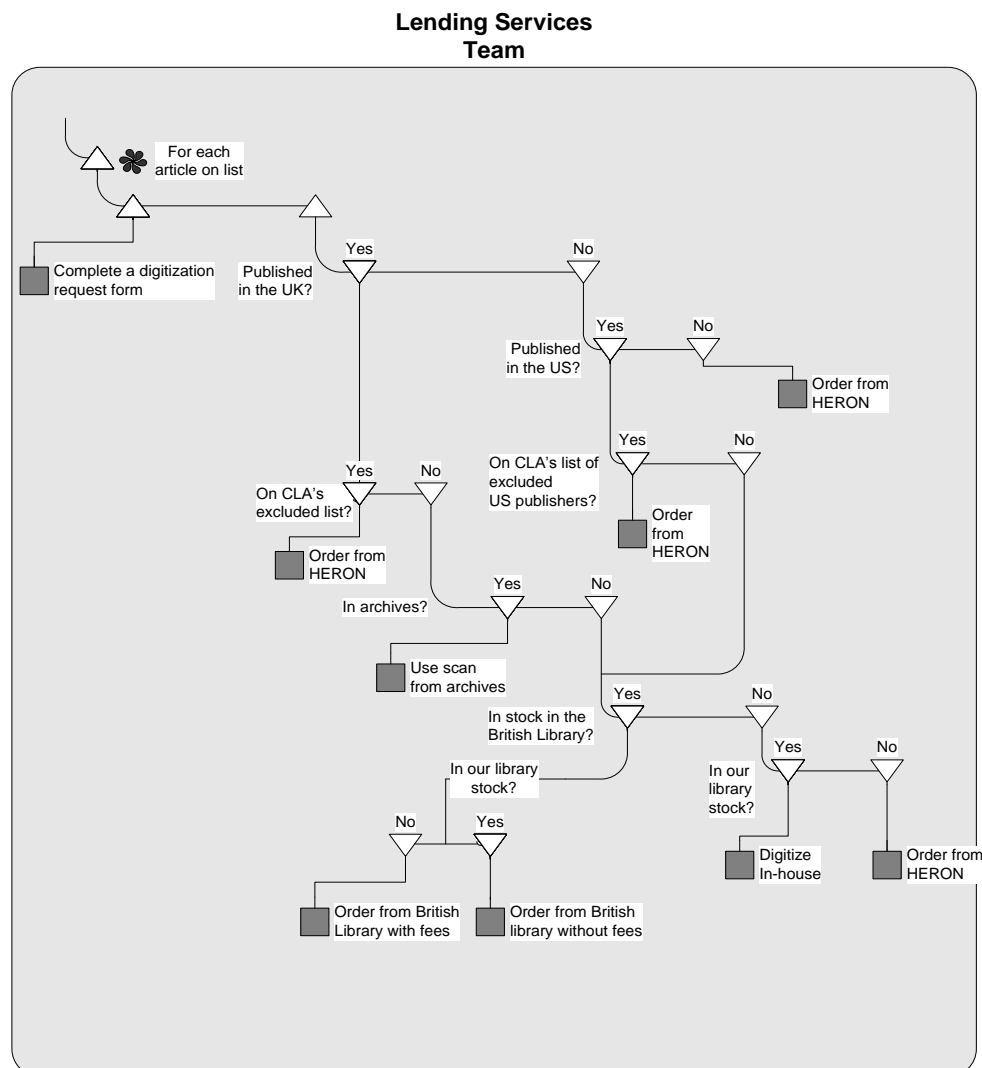


Figure 8.3 Digitization request process in UK1

Going back to the activity called “checklist” in the middle of the role of lending services team in figure 8.3, it was mentioned before that this activity makes it easier to take a decision about where to get digitized material from, which connects really to the last activity “proceed with digitization or ordering”.

The following diagram describes the decision made regarding digitizing material: whether to order it or digitize it in-house. At the stage of completing the checklist, no order is made and no digitization is processed as further checking should be carried out too. The checklist, however, makes it easier later when an order needs to be placed, because according to the checklist a decision will be made on the digitization source, as can be seen in the next figure.



**Figure 8.4 Decision-making process for digitizing material in UK1: order or digitize in-house**

### 8.3.2.1 Associated challenges

Challenges emerge as UK1 is getting involved in digitization. It was mentioned in section 8.6 that intellectual property and copyright issues act as an obstacle to digitization in some cases. In UK1 for example, the two members of staff interviewed from the lending services team stated that they are restricted to digitizing material from the UK and the USA only, and they consider this one of the challenges they are facing and wish for this to change:

*We are restricted to digitizing materials in Britain and US, and even within that some authors and publishers refused permission for digitization, and anything outside that we are not allowed to digitize... I hope it changes, if they allow a photocopy I can't see why it can't be done.*

A library assistant in the lending services team discussed the Copyright Licensing Agency (CLA) licence, he stated:

*If there is anything I wish to change it will be the CLA licence... everything we digitize has to be entered on record sheets, that includes all the details of the article, that is time consuming, and those have to be sent every six months, so much paper work.*

To add to this challenge, it was concluded from the interview with the lending services team leader that individual departments within the university are not fully aware of the value of digitizing material such as study packs: "International Politics department have bundles of chapters bound together and distributed to students, they should be aware it is costly and difficult!". So persuading lecturers of the service and its great advantage is a challenge. A library assistant in the lending services team added:

*A lot of lecturers have been using a different system for so long, and the reaction we get quite often, well, if it is working why fix it. They are happy with the current system of work: they copy what they want, put them in a box file, so students come to the library and copy what they need. There are so many reasons why people would be better (off) to have it digitized but it is so difficult to persuade people.*

To overcome this challenge however, an emphasis on marketing strategies is important to raise awareness about digitization and its advantages. Although there are two customer service managers for marketing, the leader of the



lending services team argues: “we hope to promote the service more, we do have information on the web but it is too much to read”.

The third challenge is related to digitizing theses, which has not been deployed in UK1 yet but they signed up for it. Copyright is an issue here as well as individual consent is needed.

Finally, the assistant director in UK 1 hopes to enhance the university’s repository by enriching it with digitized material:

*The National Library of Wales has got a very different rationale, they look at the long term preservation routine which is not our hope to do, what we hope to do during the coming years is to increase the newly taken electronic copies for research papers from academics, so we would have a research repository, including theses copies.*

## **8.7 Theses handling**

Dissertations and theses play a major role in the educational experience, as they represent research done under supervision of academic staff, but much of this research has been treated as “grey literature” and has been hard to handle for easier access. Many institutions now believe it is essential to make this research available to other scholars. Handling theses is a very important process with electronic copies of theses, as theses are now getting into universities’ digital repositories. In many universities it is now mandatory for students to submit an electronic copy of their thesis. In related work, Xia (2007) examined self-archiving practices in seven institutional repositories by four disciplines. The analysis revealed that there is no pattern to show which discipline of the four studied has done much better than the others, as Xia (2007) states:

*The analysis of depositing patterns among four disciplines – chemistry, economics, physics, and sociology – does not support the assumption that faculty with experience of self-archiving in a subject-based repository are more likely to contribute to an institutional repository than those without.*

Haddow (2008) provided an evidence summary as a review of Xia's paper. According to Haddow's interpretation, assisted deposit - either through librarians or administrative staff - or mandated deposit of research outputs into institutional repositories appear to have a more significant effect on deposit rates, hence enriching repositories. The study showed that although some disciplines are better at self-archiving than others, and some disciplines run subject-based repositories, mandating or requiring academic staff to deposit is the only way to get stuff into a repository. However, implementing an institutional repository is not easy as it is difficult to convince academics to deposit their research work into repositories, Ferreira, Rodrigues, Baptista and Saraiva (2008) testify to this:

*The task of convincing researchers to deposit their publications in the institutional repository is, by far, a repository manager's most demanding task. A great deal of research and imagination are needed to attempt to counter the initial reluctance of researchers to begin depositing their research materials in the institutional repository.*

To tackle the problems of low deposit rates, the authors devised a strategy - at the University of Minho/Portugal - composed of four components, these are: developing a promotional plan, developing value-added services for the authors such as providing user guides, and useful statistics (e.g. how many times it has been downloaded), the third component concerns further involvement in the international repositories (e.g. allow comments and recommendations), and finally, mandating academics to deposit their research with offerings of financial incentives to promote deposit.

From the perspective of the process modelling the interest is probably that some libraries leave it to academics to do part of the process, others take the initiative and lead on the deposit tasks.

For this research, the process of theses handling varies from one case to another. JO1 follows certain process to receive theses and shelves them in the deposit centre. JO2 on the other hand does not look at handling theses as a separate process and they do not have specialized people assigned for this job. Instead, they deal with them just as any other library material. However, JO2 provides a comprehensive database for students and staff to access

dissertations through ProQuest database in full text since 1997, in addition to abstracts for older theses.

In the UK universities, much attention is given towards accessing theses online. Theses and dissertations have been a primary source of information produced by higher education institutions. Academic libraries are becoming more and more interested in moving the workflow and management of those theses into the digital realm. Managing research within universities is essential especially in such highly competitive and collaborative environment. JISC supports academic institutions in the UK by providing innovative programmes to bring about original and effective solutions to fully demonstrate and exploit potential of information and communication technologies, to access highly quality research sources and to preserve digital collections (Jacobs, Thomas and McGregor, 2008).

Regarding electronic theses handling, JISC launched the Digital Repositories programme in 2005 and completed it in 2007, the programme embraced three e-theses projects as listed in JISC (2010a), and these are:

- EThOS project, co-supported by the British Library and the Consortium of University Research Libraries (CURL).
- Evaluation of options for a UK electronic thesis service, an independent evaluation of the EThOS prototype service.
- Repository Bridge: automated linkage of national and institutional repositories. The project examines the interaction between a regional theses repository based at the National Library of Wales and pilot institutional repositories which are currently under development at the University of Wales Aberystwyth and the University of Wales Swansea.

EThOS (Electronic Theses Online Services) has been mentioned in section 4.6.3 to discuss collaborative involvement of UK1 and UK2. According to Russell (2009), EThOS – which was implemented in 2009 – has helped to raise the visibility of UK research since it has been providing a service to the research community to access UK theses. It offers a single source of access where researchers can access most theses produced by UK higher education,

and it also supports the movement towards e-theses. Russell (2009) states that the service proved to be very popular:

*In the first quarter of operation (20 January to 20 April 2009), the volume of requests via EThOS was more than 10 times the level of activity under the previous thesis service. It is fair to say that although we knew the service would be popular, this increase in demand exceeded all expectations and has had an impact on everyone concerned.*

However, this movement from an expensive, slow, paper-based or microfilm-based technology to an open access service has raised challenges. On the top of these challenges is the backlog, as many requests were received regarding materials that are not available electronically, which generated work for the EThOS digitization team. Not only does this affect institutions that support open access to their theses in terms of handling budgets for that digitization work, but also affects readers who found themselves having to wait longer than expected for newly digitised theses to be delivered.

According to Russell (2009), the British Library and the Higher Education Institutions are rising to those challenges: “the EThOS team members at BL set up extra shifts and upgraded equipment to increase throughput, and are steadily working their way through that backlog”. HEIs on the other hand found their own ways of dealing with large number of requests for their theses, some were able to allocate extra staff time and funds. To be optimistic, once orders are uploaded on the system, they are available for repeated downloads and no longer require further efforts. In addition, library staff responsible for theses requests would have much more spare time since the theses request process is changing and might disappear when all theses are available electronically. A study of EThOS as a model for a UK national electronic thesis was the second project undertaken by JISC regarding e-theses. The general results according to Key Perspectives Ltd and UCL library services report (2006) are:

*Three quarters of institutions say they would participate in a national survey based on the EThOS model. Almost 90% want digital copies to house locally. No universities we consulted have any plans for their own retro-digitisation of thesis holdings. This is simply not a high priority for their budgets. Nevertheless, they all welcomed the chance*

*of obtaining digital versions of older theses and considered the EThOS proposal to digitise on demand a good one.*

ASLIB (Association of Special Libraries and Information Bureau) Index to Theses is another way of searching online for theses accepted for higher degrees by the universities of Great Britain and Ireland (Index to Theses, 2011). Subscription is necessary to be able to view theses, and it is done through the IP address. UK1 has access to Index to Theses from the computers within the library.

Creating and preserving digital repositories is challenging as they integrate with technical systems and policies. JISC has funded a Repositories Support Project (RSP) to provide training to repositories managers (JISC, 2010d). JISC has also undertaken the Repositories and Preservation Programme (JISC, 2010c), which includes Start-up and Enhancement projects. The projects were completed in March 2011. These were ten projects starting new repositories and sixteen projects to enhance existing ones. UK1 has got a digital repository and is a participating institution in one of these enhancement projects.

Digital repositories are important as they provide a digital archival record of research outputs carried out by the institution. WRAP (Warwick Research Archive Portal) is an example of the University of Warwick institutional repository which is part of the growing movement towards open electronic access (Warwick University, 2011) and Palmer (2009). To address, and enhance the wider research environment within UK universities on the national level, there is the Research Excellence Framework (REF), which is to be replacing the Research Assessment Exercise in 2014 (HEFCE, 2011). The framework is intended to assess research in UK higher education institutions (Martin, 2011). According to Jacobs, Thomas and McGregor (2008), such policy frameworks will give tangible benefits to academic institutions to further exploit effective strategies and management systems. It is worth mentioning that many projects undertaken by JISC within the Repositories and Preservation Programme emphasize tying theses into the REF. Academic institutions are trying to accommodate and provide outputs for the university's submissions to forthcoming REF. For example, the first aim of the Central

Archive project at University of Reading is to serve as an important part of the university's system for managing submissions to the forthcoming REF (Sutton, 2010).

Related work in this field in the US is the ETD system. Mikeal, Creel, Maslov, Phillips, Leggett and McFarland (2009) describe the implementation of a system for managing and preserving Electronic Theses and Dissertations (ETDs) submitted by Texas universities. TDL is the Texas Digital Library which is a consortium of public and private institutions from all over Texas. TDL has been interested in developing an ETD management and publication system for the state that would provide all necessary management services of a student's thesis from the moment it is submitted, to iterative review, to the approval process through to the final publication in the institution's repository. The implemented system considered the following issues: engaging different stakeholders, adopting flexible architecture that satisfies all needs, handling growing volume of records and increasing integration. Mikeal et al. (2009) argue that the ETD repository is a unique effort in this space, they also compare ETD system to EThOS:

*EThOS and similar systems differ in the scale of their engagement with the full ETD process; some projects federate a final collection, or assist with repository interoperability, but lack a central submittal point, or comprehensive metadata strategy.*

### **8.7.1 Theses handling in JO1**

As can be seen in figure 4.1, there is a Theses Deposit Centre in the library, which embraces large number of submitted theses from students and from all over the Arab world. Students can access and use these theses in the reading hall but they cannot borrow them. There is also the online theses repository which provides full text for theses content online, however, only registered academic staff can access them, while anyone else can only view titles without full contents.

Figure 8.5 represents the process of handling theses submitted by students within the university. The roles participating in the process are:

**Student:** the author of the thesis from JO1 university who is obliged to submit a copy of it to the library.

**Acquisitions:** one member of staff in acquisitions is responsible of handling theses.

**Cataloguing and classification team:** who receive the thesis from acquisitions and assign classification numbers to it. They also enter all detailed information on the system.

**Thesis department:** this is where theses are shelved within JO1.

**Dean of higher studies:** to receive a copy of the form given to the student by the library.

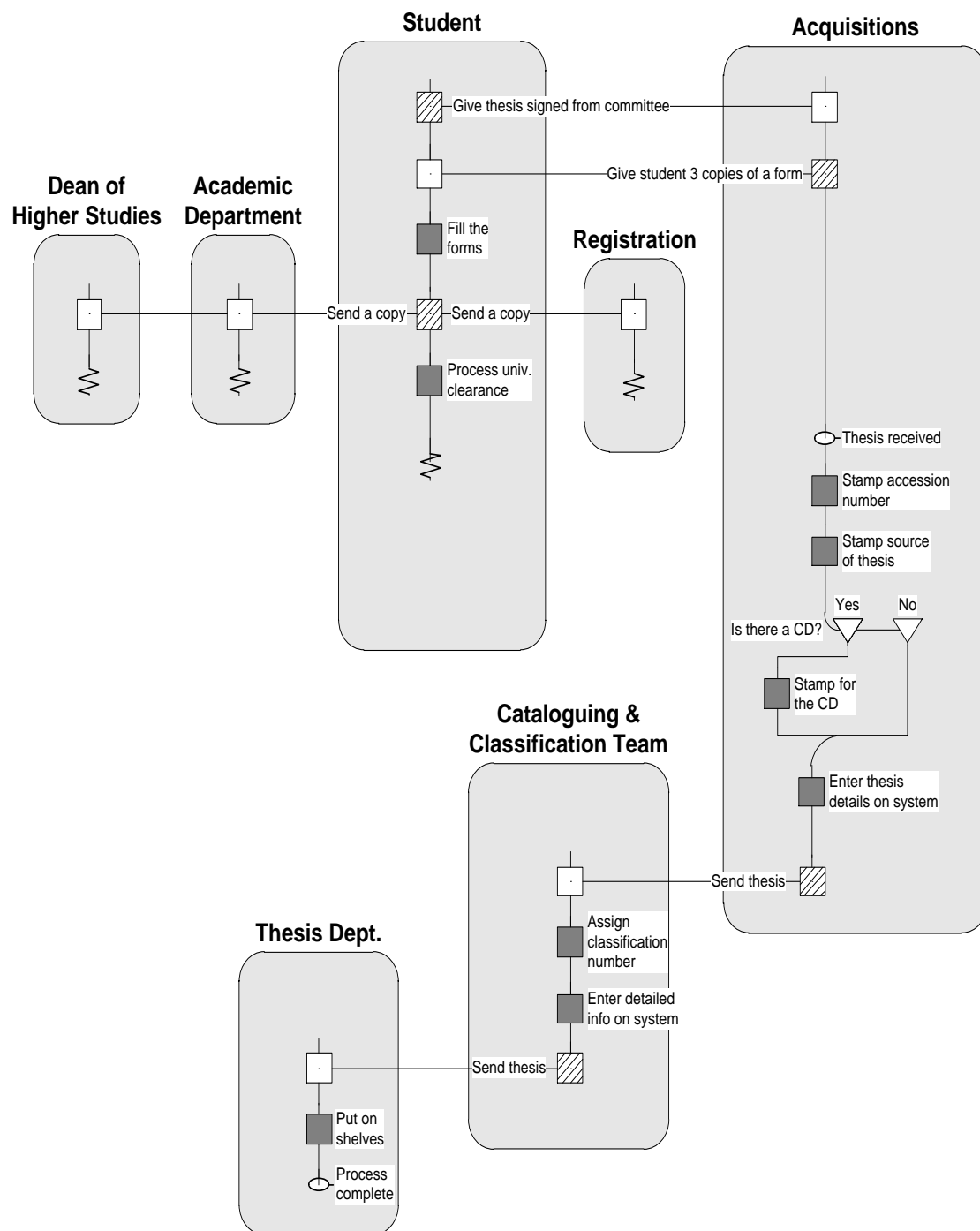
**Registration:** to receive a copy of the form given to the student by the library.

**Academic department:** this is the academic department from where the student has studied, its role lies in receiving a copy of the form given to the student by the library.

There is one member of staff in acquisitions responsible for theses which are received from students or any Arab university at any time throughout the year. It is mandatory for students to submit their theses in JO1 university, they can submit it either personally or by post. Special forms designed for each academic degree should be signed by the viva committee and attached to the thesis once it is submitted to the library. A form is then given to the student to fill and they would have to return three copies; one to registration department, one to the head of student's department and another to the dean of higher studies, the form is basically a notification that the library has received a copy of the thesis. Students should also complete a discharge/clearance form by signing it from different departments within the university to clear commitments and allow them to graduate.

The library assistant from thesis acquisitions would then stamp the accession number at the back of the thesis, he would also stamp the source of the thesis, for example: [name] University. A third stamp is necessary if the thesis

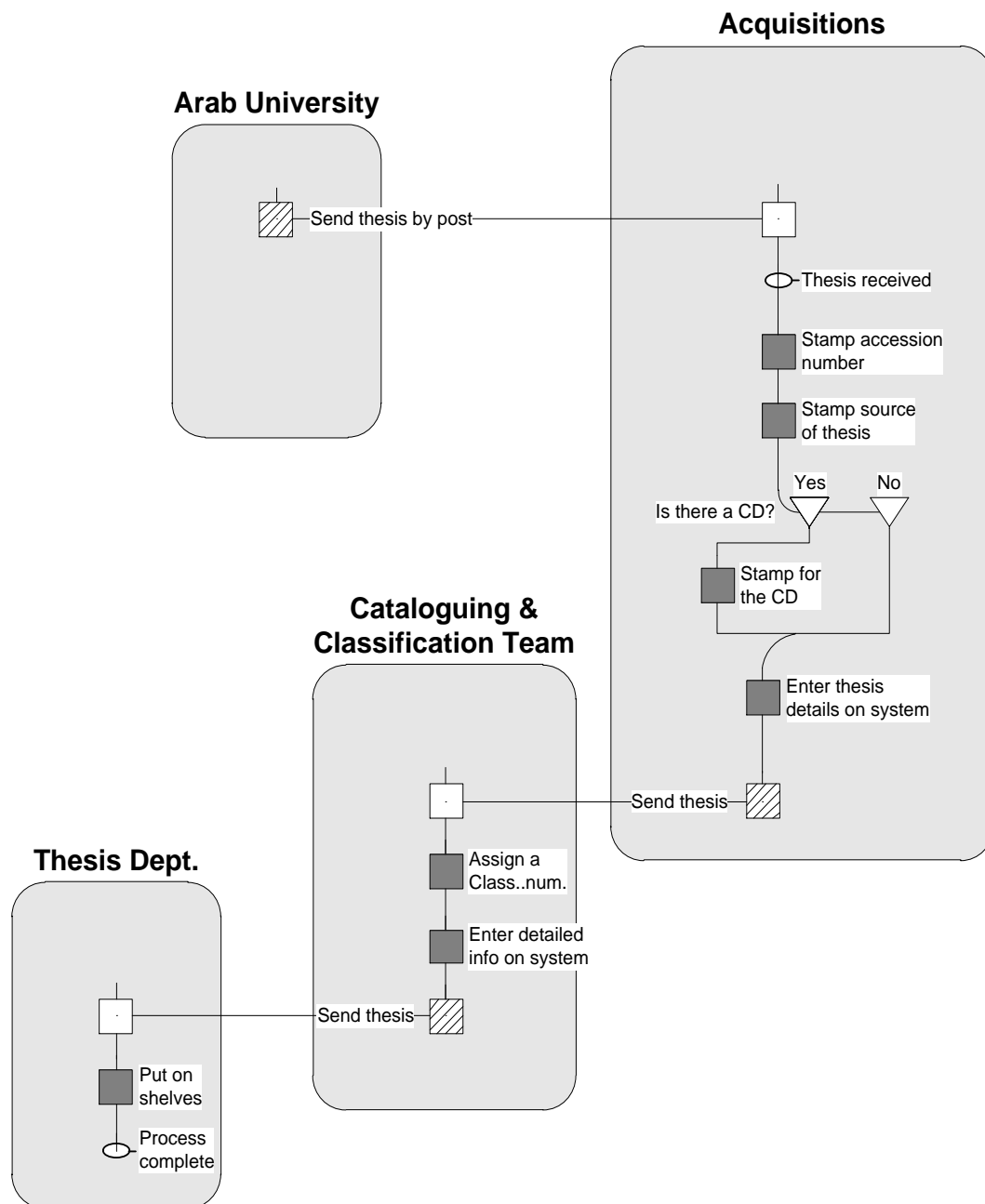
is accompanied by a CD. Basic information is then entered to the system and the thesis is sent to cataloguing and classification department where detailed information is entered on the system.



**Figure 8.5 Handling theses submitted by students in JO1**

The same process applies when theses are received from Arab universities as follows:





**Figure 8.6 Handling theses submitted by Arab universities in JO1**

### 8.7.1.1 Associated challenges

Work load - too many theses to process - is on the top of challenges JO1 is facing. As mentioned in section 7.4.1, the head of cataloguing and classification stated: “we have the problem of having too many theses to process”.

In section 8.6.1, it was mentioned that JO1 is planning to purchase special digitization machines to allow digitization in house. If this is accomplished, old theses can be digitized to be included in the repository.

### **8.7.2 Theses handling in UK1**

As mentioned in section 4.6.3 to describe collaborative involvement, UK1 has its PhD theses harvested from its institutional repository into the British Library EThOS (Electronic Theses Online Services) to offer a single source of access where researchers can access all theses produced by the UK Higher Education. In addition, UK1 has access to Index to Theses from its computers in the library since – as mentioned in section 8.7 – access is gained through the IP addresses of the subscribing institution. As mentioned in section 8.7, Index to Theses embraces theses for higher degrees accepted from universities of Great Britain and Ireland. UK1 holds printed versions of this index in store dating back from 1950, and they are available upon request. Moreover, UK1 developed an online repository which contains full text versions of successful theses for higher degrees.

UK1 do not digitize theses, as mentioned before in section 8.3.2.1, the third challenge is related to digitizing theses, which has not been deployed in UK1 yet but they signed up for it. Copyright is an issue here and individual consent is needed, the library would have to get the students to sign that they have not infringed copyright and that permissions have been sought for diagrams and images reproduced.

### **8.7.3 Theses handling in UK2**

It was mentioned in section 4.6.3 that UK2 has its PhD theses harvested from its institutional repository into the British Library EThOS and DART-Europe E-theses as well. UK2 – like most other university libraries – is moving towards e-theses, the head of information systems in UK2 states: “downstairs are

years of theses ...but a lot say that people go for electronic theses so we do not really need that space". There is a mandate on students to submit electronic copies of their theses as the head of information services in UK2 states: "there is a mandate on all students who have to provide electronic copies of their theses and we will on request digitize back copies of theses". However, the resources and facilities manager in UK2 is not very optimistic about it: "we may want to – if there was objects and time – to digitize some of our old theses, but other than that I don't really think we've got time for that".

## **8.8 Discussion and results**

This chapter has introduced three processes within academic libraries, these are book binding, digitization and theses handling. For the four selected cases in this research, these processes vary in terms of deployment and priority. In summary, according to interviews with library staff, a decision was made about processes on which "process" definition applies. Only six models of RAD were produced, these are two RADs for the Jordanian universities to represent book binding, an extended RAD representing digitization in UK1, and finally, a RAD for theses handling in JO1.

As noted from the interviews and as the PAD in section 5.2.2.5 suggests, part of the university library mission is to provide access to resources for students – and also, for some libraries with special collections such as JO1, in providing access to resources for researchers and the general population. It was also concluded from the interviews that all selected libraries are trying to integrate digitization into their workflow, but at different levels, except for JO2. It is agreed that it is now the trend towards e-resources. Following are results from the previous models. Results are listed below according to the four styles of process improvement suggested by Ould (1995):

### **1) Flow-wise improvements:**

- Reducing overall case processing time. In figure 8.3, it is probably better to check resource availability by the subject librarian before

completing a digitization request form to save time, because if the source is already available electronically then there is no need for the whole process of completing a checklist, and as can be seen in figure 8.4 the checklist process is quite long. So this kind of reordering of activities within the same role is considered flow-point improvement, Ould (1995) thought about flow-wise improvements as follows: “what changes can we make to the ordering of activities and interactions within a role in order to reduce the overall case processing time, or reduce resource requirements”.

## 2) Improvements by restructuring roles:

- Work load on some roles, JO1 has only one member of staff for thesis acquisitions, knowing that JO1 handles not only theses within the university but also those coming from other Arab universities.

There are other improvements suggested - without the use of RAD - to enhance the processes. In JO1 for example, it is good that they have a repository for online theses, however, access is only allowed to academic staff, it is important to allow students to access full text content of theses online.

There is also the challenge of lack of awareness about the value of digitization amongst academic staff. Emphasis on marketing strategies is crucial, focus not only on posting information online, but also on arranging training sessions and workshops to promote the service (please refer to section 9.4 for more information about marketing strategies).

Coming now to the external factors that affect the quantitative behaviour of the process (Ould, 1995), these can be gathered from interviews or from the setting itself, these are:

- The number of staff carrying out activities. In JO1 for example, only one person is responsible for theses acquisition, this slows the process and also affects the following process (cataloguing and classification).

Adding more people to do the job would certainly affect the efficiency of the overall process positively.

- The availability of tools – this could be applied on having digitization machines in the library to digitize material in-house.
- Cost, economic and currency situation – budgets play a major role here, as tight budgets stands as an obstacle in moving forward in digitization processes.
- Intellectual property and copyright issues, which act as an obstacle to digitization in some cases. In UK1 for example, the two members of staff interviewed from the lending services team stated that they are restricted to digitizing material from the UK and the USA only, they consider this one of the challenges they are facing and wish for this to change. Such issues limit the digitization process. As quoted before in section 8.3.2.1, a library assistant in the lending services team discussed the CLA licence and he criticised having too much paper work.

One important point to discuss here revolves around outsourcing and insourcing units of work. This is an important aspect to investigate when analysing the PAD (Ould, 2005). Looking back at figure 5.3 (the units of work diagram), one may think that some processes are better to be outsourced rather than insourced, they could be cheaper and implemented quicker this way. This certainly applies to digitization as a unit of work. Libraries must consider cost and time to decide where such units of work might fall, within the organisational boundary or not.

Digitization could be outsourced, or done on a collective basis. As noted previously, JO1 acts on behalf of other institutions, it receives theses from all over the Arab World and they are included in their digitization projects. This could be done in the UK – on a much smaller scale, there is some sort of collaboration between institutions in the UK, for example, JISC funded the Repository Bridge Project in 2005 as part of the projects in Digital Repositories programme. The aim of this project was to export electronic theses deposited in some Welsh university repositories to an archival

repository hosted by the National Library of Wales (Lewis, 2006). The deployment of DSpace (which is an open source software) in this project, together with support from one of leading universities in the scheme, provided guidance and help for some smaller university colleges to set up repositories.

The White Rose Consortium is another example on partnership between three Yorkshire's leading research universities. It offers White Rose E-theses Online to provide doctoral theses awarded by the White Rose universities (Sheffield, York and Leeds). Some of these theses are new, some are old but paid for by the consortium members to have them digitized by the British Library's EThoS (Dew, Schmidt, Thompson, and Morris, 2003).

Deployment of such projects is not easy, there is always the cost issue which is an inevitable obstacle. There was the HERON project (Higher Education Resources ON-demand) to do digitization of material. The principle of HERON was that lots of institutions would sign up to it – which would undertake digitization of texts (articles and chapters) and deal with the copyright permissions – on behalf of the institutional subscribers. According to Pickering (1999), the aims of the project were to develop a national database and resource bank of electronic texts, to negotiate copyright with representative bodies and to give some universities opportunities to market their own learning resources. The idea was that time and hopefully money would be saved as one institution would request an item to be added to the resource bank, HERON would do the digitization and copyright negotiations, and then the item would be available to other institutions.

Through this project, having multiple institutions negotiating with the copyright holders would be avoided, and using ready digitized materials might be easier. However, getting all the academics geared up to put the material on the virtual learning environment, in as consistent and legal way as possible is quite challenging. HERON ended in 2002, the need for it diminished with the rise of the e-book and e-journal collections – publishers preferred to make their offerings available that way, and more recently, some have been doing digitisation of their archive material, so HERON was not really required any more.

## **8.9 Chapter eight summary**

This chapter has discussed the remaining processes, binding, digitization and theses handling. They take place in the selected libraries at different levels, they do not receive the same priority. Modelling in RAD was provided for those processes undertaken in the selected cases, followed by a brief discussion about these processes and how to improve them based on Ould's (2005) four styles of process improvement. This small discussion and the previous ones provided in chapters six and seven act as a basis for the final discussion chapter coming next.

A summary of the improvements revealed from the RADs includes point-wise improvements such as reducing the overall case processing time in UK1 by checking resource availability before completing a digitization request form. Another improvement is related to increasing the number of staff in JO1 since only one member of staff is assigned for thesis acquisitions, and that is an example of restructuring roles.

Intellectual property and copyright issues act as an obstacle to digitization in some cases such as UK1. It was also found out that there is a lack of awareness about the value of digitization amongst academic staff in the four cases in general. Emphasis on marketing strategies is crucial, to focus not only on posting information online, but also on arranging training sessions and workshops to promote the service. Finally, digitization could be outsourced, or done on a collective basis. As noted previously, JO1 acts on behalf of other institutions, it receives theses from all over the Arab World and they are included in their digitization projects. This could be applied more in the UK.

## **9 Chapter Nine: Discussion**

### **9.1 Introduction**

The analysis in this research is integrated into the results chapters for the modelling, as the aim of business process modelling is to help to illuminate and facilitate improvements. This chapter provides an overall discussion, complementing the small discussions and the points already raised in the results sections in chapters six seven and eight. This chapter first examines how feasible Riva is as a modelling method. Then it presents all suggested improvements - revealed by RADs - according to the cases selected rather than to type of improvements. This allows comparative analysis between the selected cases as illustrated in table 9.1.

### **9.2 Feasibility of Riva**

The feasibility of a project or technology can be assessed using a number of factors such as technical, managerial, economic, financial, political and environmental. PEST analysis is a good tool for understanding the 'big picture' of the environment where the business is operating. It looks at the external business environment and at the impact of certain factors on the business environment, these factors are: Political, Economic, Social and Technical (Nelsen and Scoble, 2006). To use RIVA requires some work, and it is important to consider whether RIVA is appropriate, and how useful it might be in the current climate for academic libraries.

In section 2.5.2, evidence from the literature was provided about the use of RAD in various organisations. Comparing RADs provided in this research to those in other organisations, it was found that RAD works well in academic libraries. The performance of academic libraries was frequently assessed in terms of service quality expectations. The emphasis is on outcomes rather than internal processes. Section 2.3 discussed the application of Balanced



Scorecard in academic libraries. The balanced scorecard framework for performance assessment, which does include a criterion for internal processes, has been used much less – an example from Finland uses the ‘internal processes’ to assess the effectiveness of co-operation activities in a university library consortium (Kettunen, 2007). Town (2004) argues that the processes of interest for a balanced scorecard measurement for internal processes for the academic electronic environment should include the project management perspective, for handling new services. Apart from this recommendation, nothing substantial has been published regarding this matter. This research helps to plug the gaps in that it discusses the efficiency and effectiveness of library processes, and provides a tool to improve them.

To determine the feasibility of Riva as a modelling method in academic libraries, it is necessary to look at the following four perspectives:

- Political: academic libraries are in a period of great change, and the advantage of a tool such as RIVA is that traditional functions can be re-assessed. The PAD provides a picture of what the academic library is, or should be doing, and the RAD modelling shows how individual processes might be made more effective, or more efficient.
- Economic: Riva is economically feasible since it is not an expensive tool. The only cost needed is the availability of the software. As mentioned in section 5.4 Visio Professional 2007 is a Microsoft Office product which helps IT and business professionals communicate. It was used in this research to visualize the business process models in RADs and provide the PAD since it supports Riva notations. Other small costs would involve conducting training sessions for librarians to teach them how to use Riva and the associated software. These are also small costs since the tool is easy to learn.
- Social: employment patterns, social attitudes and public opinion fall here. One could suggest that Riva is new to librarians and might be rejected since it is considered a cultural change. Related concerns are, to what extent are librarians willing to accept this tool and integrate it into their workflow, to what extent are they ready to move from

traditional documentation to a more systemized technique? The literature review provided little evidence of formal systems and process thinking in libraries, although the empirical research found that there were some attempts at such thinking in informal documents in the library.

- Technical: on the technological side, as mentioned before, Riva needs software (a modelling tool) to be able to draw the diagrams, which is again, feasible. Although there are few studies in the literature applying Riva, such as (Green, Beeson and Kamm, 2006), (Odeh, Beeson, Green, and Sa, 2003), one challenge is that Martin Ould is the creator and the only reference to Riva. This is considered one limitation as no one else has developed the method.

Riva is feasible in academic libraries since they are organisations with bureaucratic structures, where roles are clearly defined. More discussion of the influence of the type of organisation on the rational assumptions underpinning RIVA is provided in section 10.5.

Riva is composed of a set of ideas; there is no obligation to use them all at the same time. Ould (2005) states that you can pick up what you need. Riva is an experimental / exploratory method that cannot be proved unless it is put into use. According to Ould (2005), in choosing a process modelling method, one shall be looking for “intellectual machinery” rather than just a notation or drawing pictures. He argues that the Riva method includes techniques for the following:

1. Chunking of overall processes within an organisation. This was exemplified in figure 5.4 (Process Architecture Diagram) which provided an overview of what major processes academic libraries have, how they relate to each other, how the whole business makes sense, and how day to day processes – or what Ould called it figuratively “coalface” processes – and management processes are covered.
2. Discovering and modelling an existing process. In chapters six through to eight, major academic library processes were modelled using RAD. As it can be seen from the previous models of RAD, it was possible to

represent processes in RAD, including their activities, actors and interactions.

3. Ould (2005) states that modelling processes may have five motivations, which he referred to as four Ds and one E, these are: discovery, definition, diagnosis, design and enactment. For this particular research, the goal behind process modelling using Riva is to define processes and diagnose them for improvement.

According to the results documented in the previous chapters, Riva proved to be a good method to model library processes in this research. It seems fair to conclude that:

1. Riva is a precise method that captures processes in precision enough to produce a model ready for execution. "When you use Riva you have the opportunity to be very precise, whether or not you choose to take that opportunity" (Ould, 2005).
2. Riva is quick and easy to learn. Once it is learnt, one can draw diagrams quickly and easily, the tool used adopts the drag and drop facility.
3. Not only does Riva save time but also saves paper work. It reduces the paper work needed to describe processes and list their activities in steps. As mentioned earlier, some process documents were collected from library staff to help understand processes, but these documents were long and very wordy (and unlikely to be used, although it is difficult to demonstrate that).
4. Riva is considered a systemized way of presenting and documenting processes.
5. Riva is relatively straightforward to enact, as stated by Green and Ould (2004) and claimed by Khan, Odeh and Solomonides (2006). In this research, a few RADs (although possibly flawed) were run past some library staff in attempt to make sure that all necessary activities were captured. The feedback received was promising. The bibliographic services team leader in UK1 for example commented on the associated RAD as follows: "the diagram is excellent – very clear and accurate".

Similar reaction was given by the head of cataloguing and classification department in JO1. On the other hand, the UOW diagram was also run past the support services manager in UK1 to make sure all units of work were captured. It was clear and easy to understand, comments were given by her as explained in the general notes in section 5.2.2.3.

6. Riva has the potential reuse for system change and replacement. Ould (2005) claims that organisations with the same business will have the same process architecture. Green, Beeson and Kamm (2006) tested this statement by applying Riva to two higher education institutions, to create both kinds of process architecture. The PADs produced from the same essential business entities were reviewed and the result was that they had great potential for reuse. This implies that such a PAD can be used for another organisation in the same business or it can be used as a reference to assess the relationships between its processes.

Later in section 10.5, challenges faced throughout this research are discussed. The second challenge refers to modelling in academic libraries. As mentioned in section 2.5, there is little evidence in the literature about modelling done within academic libraries. There is a lack of “big picture” modelling solutions for academic libraries to help them appreciate their position within the wider organisation. Therefore, through the PAD in Riva, such a “big picture” can be provided. This point is referred to again at the end of section 10.2. Note that in section 10.4, the PAD is regenerated to demonstrate the feasibility of producing a high-level process model applicable to university libraries in general.

### **9.3 Comparative analysis**

In table 5.3, a summary of the processes modelled in RAD in this research was provided. The next table provides a comparison between the four cases in terms of application of these processes along with their associated challenges:

## Acquisitions

<b>Jordan vs. UK</b>	JO1 and JO2 divide the process of material acquisitions into two parts: print books versus electronic collection (the latter includes print periodicals in JO1). As noted in chapter six, both JO1 and JO2 combine e-book and e-journal purchases into one process that is of electronic resources acquisitions. Note that the acquisitions department deals only with print books. The hierarchy in Jordan is different to that in the UK, Jordanian libraries tend to totally separate electronic purchases from the acquisitions department, this means that acquisitions in Jordan deals with print books mainly while the electronic resources and database team deals with anything electronic. UK1 and UK2 look at material acquisitions process differently, they divide the process in terms of journals versus books, so those who deal with book purchases also deal with electronic book purchases, the same applies for journals, those who deal with print journal purchases, also deal with electronic journal purchases. The UK way is simpler, as quoted before in section 6.4.1, the director's assistant in JO2 asserted this when she was asked about the acquisitions process			
<b>Features &amp; Challenges</b>	<b>JO1</b>	<b>JO2</b>	<b>UK1</b>	<b>UK2</b>
	<p>1. space problem for periodicals and more space is needed for reading</p> <p>2. there is preference towards e-resources</p> <p>3. no serious budget problems</p>	<p>1. space is not a problem</p> <p>2. low tendency towards using e-resources even amongst tutors (user uptake of emerging technology)</p> <p>3. bearing high journal costs of alone sometimes. There is no government fund</p>	<p>1. space problem - physical merger of different libraries on the distributed university campuses . A more purpose-built external store for books is needed</p> <p>2. raising awareness about the value of library resources</p> <p>3. inflation rate, higher costs of journals. VAT is applied on e-resources and combined purchases</p>	<p>1. space is not a problem</p> <p>2. training sessions needed to raise awareness of reliability of library resources</p> <p>3. inflation rate – budget problems and the university is currently applying staff freeze</p>

	<p>4. more staff are needed</p> <p>5. librarians problem of low payments &amp; financial rewards</p>	<p>4. too much confidence amongst database team with not much motivation to improve</p>	<p>4. more staff are needed, but cannot bring more in as the university is currently applying staff freeze policy to deal with tight budgets</p> <p>5. developing better searching systems is a challenge</p> <p>6. keeping the catalogue up-to-date is a challenge</p> <p>7. providing better access to resources to off-site students is a challenge</p> <p>8. being research intensive university is an essential part of the business, challenge of supporting research activities effectively</p> <p>9. keeping the balance between e-books and print ones</p> <p>10. make sure users have proper access to e-books</p>
Cataloguing and classification			

Jordan vs. UK	This process is more straightforward. In all four cases acquisitions start the process, but their involvement varies from one library to another. There is also the “subject librarian” role that seems to exist only in UK libraries rather than Jordanian ones, in Jordan, a cataloguing and classification library assistant does this job. In Jordan, processing is part of “cataloguing and classification” role, while processing takes a separate role in UK libraries.		
Features & Challenges	JO1	UK1	UK2
	1. work load – more staff needed	1. time pressure, too much work and a few people to do it  2. complex coding system – reclassification of stock is needed. Knowing that different classification systems are used in the two campuses to be merged	1. more computers are needed for catalogue search
Binding			
Jordan vs. UK	Binding is a separate process in JO1, there is a specialized department that deals with book binding. There is also allocated budget for book binding. In JO2 binding is also outsourced but does not have the same priority as it does in JO1. In the UK libraries however, binding does not exist as such.		
Features & Challenges	JO1		
	1. improving the system and developing new enhanced features  2. work pressure as binding takes place in batches		
Digitization			
Jordan vs. UK	Digitization could be represented in RAD only in UK1 as there is a process for digitization requests and also for deciding whether to order digitized material or digitize in-house. Projects are taking place in JO1 to digitize materials. However, it does not exist as a process in UK2 or JO2.		
Features &	UK1		

<b>Challenges</b>	1. intellectual property and copyright issues  2. raising awareness within academic department about the value of digitized materials  3. digitizing previous theses  4. enhance the university's repository by enriching it with digitized material		
<b>Theses handling</b>			
<b>Jordan vs. UK</b>	The trend is moving now towards e-theses. University libraries are mandating students to submit electronic copies of theses to be included in repositories. Theses handling existed as a process that could be modelled in RAD in JO1 only at the time the research was conducted. In UK1 however, access to e-theses was provided via EThOS and Index to theses. UK2 had its PhD theses harvested from its institutional repository into the British Library EThOS and DART-Europe E-theses as well. JO2 is behind in this area.		
<b>Features &amp; Challenges</b>	<b>JO1</b>	<b>UK1</b>	<b>UK2</b>
	1. start digitizing in-house  2. work load - too many theses to process	1. challenge of digitizing theses, not yet deployed but they have signed up for it. Copyright is an issue here and individual consent is needed	1. challenge to digitize theses, if there was time available

**Table 9.1 comparison between Jordan and the UK libraries studied, in terms of application of processes along with their associated challenges**



A common trend in the table above is the tendency towards e-resources, as to many users now, if it is not online, it does not exist (Estelle and Woodward, 2009). Digital library collections make it easier for users to access resources. This trend also supports growth of institutional repositories and open access. However, it is accompanied with many challenges. According to Estelle and Woodward (2009), UK academic libraries have been going through a 'serials crises', in 2006/2007, UK academic libraries spent over £107 million on journals. E-journals are consuming an increasing proportion of acquisitions budgets as well. This change and other changes have affected the library and the whole organisation (university) in many ways such as:

- clearing library shelves and moving towards e-resources (providing more access to staff and students who expect information to come to them)
- expansion of universities and embracing distance learning (need for universities to attract and retain more students, but at the same time students are financially pressured (higher fees) and often working part-time, adding to the need to have study materials easily accessible)
- improving inter-disciplinary research (biomedical/bio-informatics, and digital humanities, for example)

The librarians' role is also affected by this involvement in the digital environment. Librarians should not assume that users are information literate, as according to Estelle and Woodward (2009) many users have difficulty in evaluating the quality of e-resources.

There have been some changes in the focus and direction of librarians' roles in academic libraries. Librarians should try to position the library to be more responsive to the users constantly changing requirements (Carroll and Brink, 2006). Lynn, et al. (2011) identified some future roles librarian may embrace such as: partners/collaborators, evidence-based medicine experts, information filters, embedded informationists, or professionals who push resources where people will find them.

It is normally considered important to have close liaison between librarians and information specialists who tend to concentrate on acquisitions, storage

and retrieval of information, and those who are technically responsible for giving access to materials, and concerned with things like saving storage space and effective processing (Ngulube, 2004). It is also important to have close liaison with academic staff. There are some published examples of methods used. To achieve development of proactive links and liaison with academic staff, the Academic Liaison Team (ALT) was formed in January 2006 at Nottingham Trent University (Neal, Parsonage and Shaw, 2009). This acted as a response to results of workshops carried out with academic staff and students in 2008 to identify the values and irritants of its customers. The workshops revealed a need for the development of a 'proactive partnership' between academic staff and the library along with improvement of information skills work with students (McKnight and Berrington, 2008). The role of this team provides accountability at a senior level for developing four aspects: enquiry and reference services, information literacy, widening participation (reviewing services for all students including distance learners and disabled students) and research support. This perhaps an unusually deep and wide-ranging model of proactive partnership as in other universities, the subject librarians have found themselves divorced from the learning technologists, and work on the VLE (Corrall and Keates, 2011). In some institutions, productive relations exist (Dale and Cheshir, 2009), but there may be practical, as well as political reasons for lack of good working relationships in others.

Such differences should show themselves on business process modelling diagrams. The development and maintenance of information literacy programmes was not modelled during the thesis research, but such modelling and comparisons among different universities might provide some ideas for librarians in changing the structures of support for students.

A final point to discuss here is the problem of university politics. Urquhart and Bonarou (2011) refers to inscription as "the way in which technical artifacts embody patterns of use". An example in this research might be that of reaching a stage where an academic liaison team in JO1 and JO2 is seen as the norm and part of the work practice. Urquhart and Bonarou (2011) used the Actor-Network Theory (ANT) to bring out some of the political assumptions in

library developments, it helped explain how a new learning management system was 'problematized' and solutions rationalized to achieve benefits to the users (and the system support staff). ANT is a social theory which involves actors (people, objects or organisations), and it embraces four stages that include all negotiations and acts performed by actors to convince others to support them and reach inscription. Neyland (2006) also used ANT to emphasize that university strategy could be rethought of an on-going achievement that involves the connection of various entities into a process.

Librarians should look at processes more closely. As was noted in previous chapters, the PAD provides a big picture of the structure of the organisation. Librarians are increasingly urged to become organisational experts who can see the big picture and the components necessary to reach goals (Lynn, et al., 2011). RAD on the other hand is a modelling tool that provides a common language. Waring and Wainwright (2002) states: "communication and discourse can only take place through a common language - the models and diagrams". The richness of data RAD provided allowed processes to be studied in more detail, and gave insights about possible improvements.

The following is a reminder of what was mentioned in section 6.7 about what RAD provides:

- RAD offers a common process representation that facilitates understanding of the process.
- It is an analysis method that can be documented for further work or for any new appointed staff.
- It can serve as a basis for improvement and management by supporting the analysis of process performance and behaviour.
- It is flexible in drawing and it offers multiple useful features like triggers, iteration and deadlines. This might throw the analyst's attention when time is vague or undetermined in the process.
- Looks at activities- can some be done in parallel to save some time?

*RAD reveals features, but does not solve problems.* It acts as a searchlight, reveals problems and suggests potential ways of attacking those problems,

sometimes it is very clear but at other times much more effort is needed to reveal it (Ould, 1995). RAD also looks at helpful activities, for example, in section 6.7, it was mentioned that RAD looks at helpful activities for ensuring that what is purchased will be what the university library really needs for its users, mainly academic departments and students. This is very important as it provides models of how costs of periodical acquisitions can be controlled.

At the end of chapters six, seven and eight, brief discussions about the processes modelled were introduced along with results for process improvement. Suggestions for process improvement were presented and classified according to Ould's four styles of process improvement: point-wise improvements, flow-wise improvements, improvements by restructuring roles, and realigning the organisation to the process. In the following sections however, these improvements that were revealed from the RADs are discussed again but classified according to the four selected cases for this research, in attempt to provide an effective cross-case comparison of the improvements suggested, and to measure how much improvement is needed for each university library.

Before discussing these case-specific suggestions for improvement in detail (sections 9.3.1 through to 9.3.4), the next table summarises the points discussed to provide an overview. The points are expressed concisely in table 9.2 and the numbers tied to some of these improvements indicate that they occurred in more than one process for this case. After that, improvements grouped under each case study are explained in more detail and also tied to the type of improvement (point-wise, flow-wise, restructuring, and realignment), to finally form table 9.3 as a summary of the results.

Type of improvement	JO1	JO2	UK1	UK2
Point-wise	Enhancing communication  Adding timeline  Identifying the right time to do an action	Enhancing communication (3)  Using better tools to reduce paper work	Enhancing communication (2)	Adding timelines  Reducing paper work
Flow-wise	Increasing parallelism  80:20 rule  Reducing complexity	Increasing parallelism  80:20 rule	80:20 rule  Reducing overall case processing time	
Restructuring	Unnecessary tasks (2)  Work load on some roles	Unnecessary tasks  Work load on some roles	Work load on some roles	Moving activities between roles
Realignment	Adding roles (3)  Adding more activities within roles (2)	Adding roles (2)  Adding activities within roles (3)	Adding roles  Adding activities within a role  Deleting existing roles	Adding roles  Splitting roles

**Table 9.2 Summary of the improvements suggested for the four cases**

### 9.3.1 JO1 improvements

1. *Enhancing communication – point-wise.* Enhancing communication between JO1 and the consortium centre which is not located in the same city. Use of effective resources is advised in figure 6.1. Reducing paper work and introducing better tools for communication such as

emails instead of internal mail to shorten cycle time can be used to enhance the process of book acquisitions.

2. *Identifying the right time to do an action – point-wise.* For example, in figure 6.2, when is the right time to carry out title unification? More precision can be added to the diagrams by clarifying any deadlines.
3. *Adding timeline – point-wise.* When speaking of time, there is also no deadline or determined period of time in figure 6.1 for the consortium centre to receive offers. When compared to UK2 however, a great strength in figure 6.7 is the attention paid to time and deadlines which reflect systematic work.
4. *Increasing parallelism – flow-wise.* Instead of waiting for library administration approval after ordering the journal, sending a copy of the invoice at the same time to both finance and library administration will save time and run the periodical acquisition process more efficiently, especially since the serials department seems to be the decision maker when it comes to e-resources acquisitions.
5. *Reducing complexity – flow-wise.* In figure 6.8, three signatures are required for approval from the library's committee after books purchase, and a fourth one would be required if the amount was over 100,000 JDs. This procedure – if necessary - is probably more useful to take place before ordering books, otherwise it is considered "figurehead" rather than purposeful, and it would slow the process, especially as approval letters travel by internal mail between members of staff, which leads to the following point, that it is now time to minimize paper work.
6. *80:20 rule – flow-wise.* Does every book purchase need to be authorized by the director? According to 80:20 rule - from generalists to specialists (Ould, 2005), getting approval can be limited to those purchases of a certain value.
7. *Unnecessary tasks – restructuring (twice).* Such as "transfer the offer". In periodical acquisition in figures 6.1, 6.2 and 6.3, faculty representatives approach library administration before they reach serials or periodical departments. 'Administration' role here can be

considered third party in between other roles' interactions, which does not really add much value to the process.

8. *Work load on some roles - restructuring.* There is a big load on the cataloguing and classification team. This could be considered a difference between Jordanian and UK libraries, as in UK libraries work seems to be divided fairly between the assigned roles (acquisitions, subject librarian and processing). As mentioned in point seven, a separate role for 'processing' can be added and all processing activities that reside in the cataloguing and classification role can be moved to the new 'processing' role. There is also a big load on the member of staff responsible of theses acquisitions. One person is handling theses although JO1 receives theses from other Arab universities
9. *Adding more activities within roles – realignment (twice).* In figure 6.1, the consortium centre would receive offers from publishers then pass them around to all members of the consortium (all public universities). Each university would then study the offer and decide. More team work and communication within this role (members of the consortium centre) could be emphasized here to discuss the offer and how beneficial it could be to each university with consideration of cost being distributed between the members. Moreover, for cataloguing and classification process, figures 7.1 does not pay attention to showing book status on the system. This is considered a difference point between UK and Jordanian libraries where in the UK libraries an activity like "amend status" is included in the models.
10. *Adding roles – realignment (three times).* From the RADs provided in material acquisition process, it is clear that there is no role of liaison librarian. This is a big difference between UK and Jordanian libraries. As mentioned in section 9.3, it is important to have close liaison between librarians and academic staff to achieve development of proactive links and provided better services. Moreover, figure 6.3 does not seem to consider academic departments when reaching a decision about purchasing periodicals. On the other hand, according to figures 6.1 and 6.2 and based on the interview with the head of serials and e-

resources department in JO1, there is huge work load on this role, more roles or more staff within this role should be added to help the head of department do the job. In addition, for cataloguing and classification process, it would be advisable to add a separate role for processing to reduce the work load on the cataloguing and classification team.

### 9.3.2 JO2 improvements

1. *Enhancing communication between roles using better tools – point-wise (three times).* Although JO2 in figure 6.4 saves time when dealing with invoices by sending out copies in parallel to both library director and finance, still, in figures 6.4 and 6.5 the order is sent to the assistant director to sign for approval. Knowing that budgets are predetermined, isn't it time to minimize the paper work? In addition, reducing paper work and introducing better tools for communication such as emails instead of internal mail to shorten cycle time can be used to enhance the process of book acquisitions.
2. *Using better tools to enhance the process and to reduce paper work – point-wise.* In cataloguing and classification process, information is filled on a piece of paper then entered again on the system. This particular point asserts the demand for change in the culture and mentality of library staff, because they know it should be improved but nobody does anything about it, "it has been the way of doing things" was the answer.
3. *Increasing parallelism – flow-wise.* At the end of book acquisition process in figure 6.10, sending the book's invoice to finance and entering books details on the system can be done in parallel to save time, knowing that different people perform these activities.
4. *80:20 rule – flow-wise.* Does every book purchase need to be authorized by the director? According to 80:20 rule - from generalists to



specialists (Ould, 2005), getting approval can be limited to those purchases of a certain value.

5. *Unnecessary tasks - restructuring.* Such as “transfer the offer”. In periodical acquisition in figure 6.5, faculty representative approach library administration before they reach serials or periodical departments. ‘Administration’ role here can be considered third party in between other roles’ interactions, which does not really add much value to the process.
6. *Work load on some roles - restructuring.* There is a big load on the cataloguing and classification team. This could be considered a difference between Jordanian and UK libraries, as in UK libraries work seems to be divided fairly between the assigned roles (acquisitions, cataloguing assistant, subject librarian and processing). As mentioned in point eight, a separate role for ‘processing’ can be added, and all processing activities that reside in the cataloguing and classification role can be moved to the new ‘processing’ role.
7. *Adding activities within roles – realignment (three times).* For cataloguing and classification process, figures 7.2 does not pay attention to showing book status on the system. This is considered a difference point between UK and Jordanian libraries where in the UK libraries an activity like “amend status” is included in the models. RAD can reveal problems or any lack of detail. Note that figure 6.10 of book acquisition do not show what happens if the ordered book was not correct. An ‘if statement’ is needed. In addition, figure 6.10 shows that the library does not check if requested books were available on the system electronically or not. They just proceed with the ordering process.
8. *Adding roles – realignment (twice).* From the RADs provided for JO2 in material acquisition process, it is clear that there is no role of liaison librarian. This is a big difference between UK and Jordanian libraries. As mentioned in section 9.3, it is important to have close liaison between librarians and academic staff to achieve development of proactive links and provided better services. Moreover, in cataloguing

and classification process, it would be advisable to add a separate role for processing to reduce the work load on the cataloguing and classification team

### 9.3.3 UK1 improvements

1. *Enhancing communication between roles using better tools – point-wise (twice).* In figure 6.6 for periodical acquisition, the order is sent to the assistant director to sign for approval. Knowing that budgets are predetermined, isn't it time to minimize the paper work? Note the paper work in book acquisition process in figure 6.12 as well, authorization is needed twice from the library director. Interactions can be reduced between roles to speed up the process.
2. *80:20 rule – flow-wise.* Does every book purchase need to be authorized by the director? According to 80:20 rule - from generalists to specialists (Ould, 2005), getting approval can be limited to those purchases of a certain value.
3. *Reducing overall case processing time – flow-wise.* In the digitization process, it is probably better to check resource availability by the subject librarian before completing a digitization request form to save time, because if the source is already available electronically then there is no need for the whole process of completing a checklist, and as can be seen in figure 8.4 the checklist process is quite long. So some kind of reordering of activities in this process is probably necessary.
4. *Lightening work load on some roles - restructuring.* The subject specialist in the book acquisition process seems to bear a lot of acquisitions burdens. So some moving of activities between roles is probably necessary in figure 6.12.
5. *Adding activities within a role – realignment.* RAD can reveal problems or lack of detail. Note that figure 6.12 of book acquisition do not show

what happens if the ordered book was not correct. An 'if statement' is needed.

6. *Adding roles - realignment.* Looking at the initiator in figure 6.6 for material acquisition, the department representative initiates the process all the time. Can the library be open to deals offered by other providers or publishers directly? Or is it that those libraries can barely meet the academics' needs?
7. *Deleting existing roles – realignment.* In figure 7.3 for UK1, the role of subject librarian should be removed from the cataloguing and classification process, since according to existing literature, subject librarians are encouraged to be involved in other processes that have emerged in the new library environment (as mentioned in section 7.8). The activities within the deleted role can be moved to the 'cataloguing assistant' role.

#### **9.3.4 UK2 improvements**

1. *Reducing paper work – point-wise.* In cataloguing and classification process, paper slips are still used by the information advisor when classifying items.
2. *Adding timelines – point-wise.* This can be shown in cataloguing and classification process, a deadline can be added to the diagram to determine the time for removing new items off the "new items" shelves.
3. *Moving activities between roles - restructuring.* There is big load on the role named "information specialist" in figure 6.7, who does a lot of work.
4. *Adding roles – realignment.* Looking at the initiator in figure 6.7 for material acquisition, the department representative initiates the process all the time. Can the library be open to deals offered by other providers or publishers directly? Or is it that those libraries can barely meet the academics' needs?

5. *Splitting roles – realignment.* The ‘information specialist’ role in figure 7.4 for UK2 should be restricted to cataloguing and classification activities without getting involved in any of the ‘subject librarian’ activities. So this role should be split into two: ‘cataloguing assistant’ role that deals with cataloguing and classification activities in this process, and another role of a ‘subject librarian’ that should be moved out of this process.

Grouping the above suggested improvements - revealed from the RAD - according to cases selected rather than type of improvements allowed comparison between the cases and showed to what extent each case needs to move towards improvement.

The next table summarizes the number of improvements suggested for each case as indicated by the RAD models. These are classified according to improvements type, suggested by Ould (1995). This summary provides a clearer view of both the level and extent of improvement needed in the selected libraries.

<b>Improvement detail</b>	<b>JO1</b>	<b>JO2</b>	<b>UK1</b>	<b>UK2</b>
<b>No. of processes</b>	6	5	4	3
<b>Point-wise improvements</b>	3	4	2	2
<b>Flow-wise improvements</b>	3	2	2	0
<b>Improvements by restructuring roles</b>	3	2	1	1
<b>Realigning the organisation to the process</b>	5	5	3	2
<b>Total number of improvements</b>	14	13	8	5

**Table 9.3 Number of improvements suggested for each case according to improvement type**

To clarify some of the details noted in table 9.3:

- The number of processes allocated to each case refers to the number of actual processes without including special cases. For example, although JO1 has five RADs to represent material acquisitions process,

only three were considered. Small differences (such as who initiates the process) do not actually affect the process, hence, were not counted. Only major processes that have clear differences in their activities were considered, for example: print periodicals, print books, and electronic resources acquisitions for JO1.

- UK2 gains ground with the least number of improvements needed. This could be due to being an intensive research institution targeted to a specific group (postgraduates). UK2 seems to look at processes differently.
- Jordanian libraries have serious problems since they need to change the organisational structure itself. This is considered the most radical change. According to Ould (1995), these improvements may include changes in job titles, posts or functional units to make the organisation more aligned to its processes. Although both JO1 and JO2 score five points (each) in this category, JO2 stands in a worse situation than JO1 since it is a much smaller university with fewer processes and fewer users.

#### **9.4 *Other general improvements***

From the interviews conducted and through ordinary observation, other improvements were identified to enhance the effectiveness of library processes within the four selected cases. General notes follow on such improvements that are applicable in all cases, unless otherwise mentioned, with some relevant recommendations from the literature cited as well.

- Academic libraries have to provide proactive and professional marketing strategies about the services and resources they provide to students and researchers. In all four cases in this research it was found that embedding more effective marketing strategies is needed. It was also observed that the role of the subject librarian involves finding out more about user needs, and that is an essential part of marketing. Modern marketing stresses the importance of customer relationship

management, which according to Gronroos and Gummesson (as cited in Parvatiyari and Sheth, 2001), espouses the value of interactions in marketing and considers relationships with customers the main focus of marketing. To achieve effective marketing, not only should library products be pushed out to the users, but people should also be engaged in a relationship that shall encourage them to use the library services (Wakeham, 2004). Wakeham (2004) suggests that librarians should consider marketing and promotion a core element of their role. They should also be aware that the modern library is not only about the physical place, but more about the content and the ease of use of its electronic resources. This discussion leads into some of the marketing and branding on the LIS literature. Libraries should brand and market the library website so that users are aware of library resources and services (Lynn et al., 2011). According to Gannon-Leary, Bent and Webb (2008), marketing strategies can include handbooks for research staff summarizing all services, communication newsletters, blogs updating researchers on topics of interest, regular targeted emails, publicity posters, and ensuring that all electronic resources are badged with the library name so that researchers would realize they are not using free resources.

- Advise academic staff on digitization procedures, offering alternative resources if applicable and supply guidance on copyright compliance (Neal, et al., 2009). It was found from the lending services team in UK1 that it is important to advise academic staff on digitized material, “There are so many reasons why people would be better to have materials digitized but it is so difficult to persuade people”.
- Outsourcing in academic libraries. Urquhart (2002) defines outsourcing as follows:

*A decision taken by an organisation to contract out or sell all, or some of the organisation's IT assets, people or activities to a third party supplier, who in exchange provides and manages assets and services, for an agreed fee or other monetary arrangement over an agreed time period.*

In this research, it was found that JO1 allocates a process for binding, where it is outsourced (see figure 8.1). In this model, a whole role is outsourced (the interested contractor) who is responsible for binding books according to specific requirements. Note that this requires another role to monitor the contract, prepare the bid and follow up the process (binding and repairing department), which is considered one implications of outsourcing. Urquhart (2002) adds another implication of outsourcing, that some of the competencies within the library - that are probably less obvious - may be lost when work is totally outsourced. This is however is not applied to binding as Urquhart (2002) states: “bookbinding has been outsourced by most libraries for many years. Few would argue, except in the case of particular specialist libraries, that bookbinding is usually a core competence”. As a result, it is important to recognize the core competencies within the library and figure out how much should be outsourced. Although cataloguing is considered a core competence of librarians, it can be outsourced according to the resource-based theory to guarantee cost-effective solutions to major activities (Urquhart, 2002).

- Widening participation. Neal et al. (2009) states that librarians should focus more on groups that have barriers when accessing library resources. For UK2, this can be applied on off-site students who – according to the interviews – have problems accessing resources from distance. The PAD captures all processes within an organisation and also any interested actors, hence, it reflects the community of users. Such communities are prone to changes, the PAD and the RAD are able to cope with changing student/researcher communities, whether they are full time students residing on campus or off-site students.
- Having more staff in, at least in time of seasonal work when intensity of activity becomes larger. This is a problem in JO1, UK1 and UK2. In JO1 work pressure is high at exhibitions and binding periods. In UK1, acquisitions has a huge work load with a small number of staff, primarily one person, doing the job. In UK2 work increases in June when the annual journal review is conducted, where decisions are

made regarding what journals to keep, what to cancel and what to order. Work is also greater in UK2 at the beginning of the academic year when book orders start and piles of books come in. It is important to make more use of casual labour, a good example is UK1, which usually employs students from the LIS department as part-timers to help when there is an additional work load.

- As digital repositories are developing rapidly to become a key element in academic libraries, a strategy to provide repository services is needed even in the current economic situation (ARL Digital Repository Issues Task Force, 2009). Libraries are becoming more interested in collaborating with other institutions to develop many types of institutional repositories, in this research for example, all selected cases have some kind of collaborative involvement (table 4.1). According to the ARL Digital Repository Issues Task Force (2009), following are suggested important actions that research libraries must consider:
  - Build new kinds of alliances, both within institutions and between institutions.
  - Develop strategies for improving services based on substantive assessment of local needs rather than blindly replicating work done by other institutions. This is probably a good point to consider in this research, since the two contrasting sites have their differences in terms of research capabilities and expansion.
  - Have stakeholders engaged, and get involved in key local policy issues to encourage institutional engagement with national and international policy issues.
  - Going back to the first point listed in this section (9.4), marketing strategies should be developed to assist the development of repositories.

The discussion has focused on the analysis from four case studies in two countries, with contrasting conditions. As such, with the emphasis in the



research on the use of RIVA for RADs, it is not possible to do more than make the following suggestions for future consideration by educationalists, academic library managers, and university funders. As indicated in the literature review, the literature on the use of operations research techniques in academic libraries is now very dated, and the literature that exists that is even half relevant to process modelling is scattered and isolated, with little sense that connections are being made. That the need for a more structured approach is desirable can be seen from an abstract of one of the most heavily downloaded articles in the Journal of Academic Librarianship (at early 2012).

*The central argument of the article is that while the building, the collection and the staff were inseparably linked, in a digital environment these facets of the library are diverging. This divergence clouds the process of envisioning a future for the library, but, if properly defined, it is a source of clarity, which sheds light on strategic opportunities. (Sennyey, Ross and Mills, 2009)*

Although the article makes sensible recommendations on the need to take a fresh look at library purposes, there is nothing in the article that provides practical advice on the tactics available to academic library managers to review and reorganise. In fact the article provides rather breathtaking advice that “the traditional configuration of numerous library departments should be abandoned, and workflows jettisoned (p.257)”. This advice seems a little hasty, as without a deep understanding of how the existing pieces fit together, it is hard to see how improvements are possible or properly evaluated. It is therefore no surprise that another article on the skills required of digital librarians, with a content analysis of the advertisements for such posts, found that exactly one of the 87 job advertisements required technological expertise in the areas of systems development, analysis, architecture (Choi and Rasmussen, 2009). In the UK, where accreditation of LIS programmes by Chartered Institute of Library and Information professionals (CILIP) uses the former Body of Professional Knowledge (Enser, 2002) - now the Body of Professional Knowledge and Skills (BPKS) (CILIP, 2012) - it is hard to see where departments would find a suitable space for business systems and process analysis in the curriculum, and the generic management skills emphasise human resources and financial aspects. There is therefore a genuine gap between the apparent need for analytical thinking around “what

we are doing and why, and how it fits together”, as indicated in the flowcharts in the desk drawers, and the high level vision of change in pronouncements from senior academic librarians.

From the case studies in this research, it seems plausible that academic libraries that are more focused, and willing to do things differently (UK2) are likely to have done some of the groundwork for business process analysis already. Clearly, the more traditional institutions, and larger institutions, may face more problems, of sheer size (JO1), the difficulties of merging libraries (UK1), or trying to make changes consistently (JO1), or making the bridges with academic staff to assess how the library could serve their needs better (JO2).

## **9.5 Chapter nine summary**

Riva was selected as the modelling tool in this research to define processes and diagnose them for improvement. It provides chunking of overall processes within an organisation through PAD, and also discovers and models existing processes using RAD.

According to the results documented in the previous chapters, Riva proved to be a good method to model library processes in this research. It seems fair to conclude that Riva is precise, quick, relatively straightforward to enact and easy to learn. It is also a systemized way of documentation, hence, reduces paper work. According to the four perspectives (political, economic, social and technical) Riva is feasible as a modelling method in academic libraries.

This chapter provided an overall discussion built from small discussions raised in previous chapters. It presented all suggested improvements - revealed by RADs - according to the cases selected rather than to type of improvements. This classification led to results that demonstrated comparative analysis between the selected cases, and showed to what extent each case needs to move towards improvement. This is a summary of comparison between the two sites:

- JO1 and JO2 divide the process of material acquisitions into two parts: print books versus electronic collection (the later includes print periodicals in JO1). UK1 and UK2 however divide the process in terms of journals versus books.
- Cataloguing and classification process is more straightforward. In all four cases acquisitions start the process, but their involvement varies from one library to another. There is also the “subject librarian” role that seems to exist only in UK libraries rather than Jordanian ones, in Jordan, a cataloguing and classification library assistant does this job. Moreover, in Jordan, processing is part of “cataloguing and classification” role, while processing takes a separate role in UK libraries.
- Binding is a separate process in JO1, there is a specialized department that deals with book binding. There is also allocated budget for book binding. In JO2 binding is also outsourced but does not have the same priority as it does in JO1. In the UK libraries however, binding does not exist as such.
- Digitization could be represented in RAD only in UK1 as there is a process for digitization request and also for deciding whether to order digitized material or digitize in-house. Projects are taking place in JO1 to digitize materials. However, it does not exist as process in UK2 or JO2.
- Although theses handling exists as a process that could be modelled in RAD in JO1 only, JO1 does not provide electronic access of theses to students (theses are available to students in print only). In UK1 however, access to e-theses is provided via EThOS and index to theses. UK2 has its PhD theses harvested from its institutional repository into the British Library EThOS and DART-Europe E-theses as well. JO2 is behind in this area.

Grouping all improvements revealed from the RAD in chapters six, seven and eight according to cases selected rather than type of improvements allowed

comparison between the cases and showed to what extent each case needs to move towards improvement. It was revealed that:

- UK2 gains ground with the least number of improvements needed. This could be due to it being an intensive research institution targeted to a specific group (postgraduates). UK2 seems to look at processes differently.
- Jordanian libraries have serious problems since they need to change the organisational structure itself. This is considered the most radical change. Although both JO1 and JO2 score five points (each) in this category, JO2 stands in a worse situation than JO1 since it is a much smaller university with fewer processes and fewer users.

From the interviews conducted and through ordinary observation, other improvements were identified to enhance the effectiveness of library processes within the four selected cases. These were: providing proactive and professional marketing strategies about the services and resources provided to students and researchers; advising academic staff about digitization procedures; adopting suitable outsourcing frameworks; widening participation to focus more on groups that have barriers when accessing library resources; having more library staff involved in some processes; and developing a strategy to provide repository services even in the current economic situation.

## 10 Chapter Ten: Conclusion

### ***10.1 Introduction***

Library environment and the nature of work within libraries have changed radically. Work has been presented in the literature to examine the management of change and to embed innovation in academic libraries and information services throughout this period of continuous change.

Nowadays, business organisations are being described in terms of processes rather than functional hierarchies. To be able to deal with change and improve libraries' functions and processes, business process modelling can be used to examine libraries' activities, and it can also help improve processes as it involves redesigning organisations to remove unnecessary communication, processing and duplication of data (Bond, 1999).

This research was based on the Riva method (Ould, 2005), which comprises two parts: the Process Architecture Diagram (PAD) and the Role Activity Diagram (RAD). PAD was used to develop a big picture of the organisational structure and how processes are related within the organisation. RAD however was used to model library processes. The aim of this research was to focus on a business organisation (university academic library) to examine organisational processes using RAD, with the main underlying purpose to improve library processes in attempt to answer the research question: how can business process modelling using the Riva method visualize and help improve university library processes?

This work bridges library science and information technology, by applying Riva method as business process modelling technique to examine libraries' processes. There are several business process modelling techniques but Riva is probably one of the most rigorous methods. Section 2.5 discussed various methods and justified the use of Riva. To recap, the following were the objectives of this thesis research:

- Assess existing evidence on academic libraries and business process modelling, or related systems analysis methods
- Assess existing evidence on methods for change management in academic libraries that explicitly examine internal processes
- Review the scope of academic library processes, to make an informed choice about processes for more detailed analysis
- Examine the feasibility of using Riva as a business process modelling methodology in academic libraries, using four case study sites across two countries
- Consider possible improvements to processes from the models created
- Using case study design, examine comparisons between the selected sites, specially the two contrasting sites (Jordan vs. UK)
- Reflect on how the study's findings relate to Ould's claims about Riva

The first objective faced some challenges and therefore, was not met in full. Little evidence was found on the application of business process modelling in academic libraries, and what have been done and publicly available was small scale. Some of the material is not even published but could be available in internal reports. Similarly, many of the practical examples on business process modelling will be sitting in consultants' reports, not in academic articles. In addition, the literature review was difficult as operational research (and similar concerns) drift in and out of fashion in the research on management of academic libraries, and when they reappear the language and priorities may appear different.

Regarding other objectives, these were met in full successfully, modelling was provided for all processes and many possible improvements were identified. This reflects on the wider aims of the feasibility of applying BPM in academic libraries, and it also reflects on the research question and research aims. The several sub-questions within the main aim are listed below and were answered as follows:

1. *To what extent are academic libraries responding to change, and using performance measurement methods?* This sub-question was answered

through the discussion illustrated in section 2.2.1. Academic libraries have been exposed to both internal and external factors that cause organisational changes. The timeline in figure 2.2 presents the main events in attempt to respond to changes in academic libraries.

2. *Why should RIVA be the BPM method used?* The literature review introduced various modelling methods (section 2.5), but Riva was chosen for this research since – as mentioned in section 2.5.1 – RAD was included in different comparisons and evaluations that provided a generic framework for selecting a business process method, as in the Lin et al. study (2002) for example. As RADs can be used to explore features that will enable further improvement of the current process, it seemed appropriate to apply this method in this research on academic libraries in order to try to make librarians reflect on their function. Setting ‘analysis’ as an objective leads to choosing the ‘role perspective’ for viewing processes. Consequently; using RADs is suitable as RADs are a very good, and recommended example of a process modelling method from a role perspective. The other part of Riva (PAD) however, proved to be a good modelling method to represent the “big picture” of academic libraries. Later in section 10.4, the PAD is regenerated to demonstrate the feasibility of producing a high-level process model applicable to university libraries in general.
3. *How do some common library functions or processes relate to BPM processes?* Justification for selecting the processes to be modelled was presented in section 3.6.1. The chosen processes are all business processes since each comprises a set of activities that achieve a certain goal (Ould, 2005). Section 2.4 introduced the concept of BPs and BPM; the later helps understand processes and supports process improvement.
4. *Is it feasible to apply RIVA to these library processes?* The answer to this sub-question was introduced at the end in section 9.2. Although it is expected that Riva is a feasible modelling method for academic libraries (according to the literature and the criteria for selecting a modelling method), it was essential to experiment the method to

answer this question. The process models provided and the improvements extracted from these models proved that Riva is a feasible method. Section 9.2 discusses its feasibility in detail using PEST analysis.

5. *Are the findings helpful in identifying possible actions for change and improvement?* The comparative analysis and results demonstrated in section 9.3 showed that there are many possible actions for change and improvements that could be defined. These were grouped according to each case, and also mapped to their type of improvement (point-wise, flow-wise, restructuring, realignment).

## **10.2 Reflection on methodology**

Section 3.6.1 discussed the criteria used to select the sites, cases and processes. Two contrasting sites were selected; the first one is Jordan since the researcher is Jordanian and it was feasible to gain access and collect data, the second country selected was the UK since the researcher's degree registration was in the UK, and much of the doctoral degree studies took place in the UK. As illustrated in in section 9.3, the choice of contrasting sites allowed comparison and provided more scope of discussion.

The case studies are used in this research to show how business process modelling using RAD can help improve academic library processes. Yin (2003) states that the evidence from multiple case designs is more compelling and robust than that of single case design. Since each case includes more than one unit of analysis (process); embedded multiple case study design is used in this research (the fourth type in figure 3.1). The four cases were chosen purposively to reflect different academic libraries and information services. The extent of variation should be sufficient to query some aspects of processes, but not too great, as the intention was to work towards a comprehensive PAD that covers various processes. Section 3.6 discusses the justification for the choice of multiple case study design in detail.



In chapter four, the organisational structure was provided for each selected case. Table 4.1 compared the four selected cases and their associated universities according to a set of categories such as; university size and type, extent of research within the university, number of titles in the libraries, the level of collaborative involvement and the sophistication of information systems. There is a need for contextual description, this was found useful in interpretation and would need to be ascertained for any other use of RIVA in other academic libraries. Academic libraries need to be seen in the context of interactions with other academic libraries and other agencies as these influence what they do. Consequently, this needs to be reflected in the PAD since it captures the network of concurrent activity and demonstrates processes and their relationships.

Table 5.3 provided a summary of processes modelled in the four selected libraries in this research. It was learnt from the interviews that these libraries share a number of processes, which are common in almost all academic libraries, such as cataloguing and classification, and book acquisitions. However, there are other processes that do not receive the same priority, for instance, book binding is one of the important processes in JO1, but it does not seem to be of similar priority in UK2 for example.

Information gathered from library staff was the main justification behind choosing these processes, and considering them as the business processes for an academic library. Each member of library staff interviewed was asked whether their job included any kind of processes or not. In addition, on the higher managerial level, managers were asked about the processes that take place within their organisation. As a result, a number of processes were selected and modelled using RAD, a summary of these processes is listed in table 5.3 and these are:

- Acquisitions: it is a common process in all libraries. Periodicals were looked at to throw a light on the different approaches that may be developed for electronic and print periodicals.
- Cataloguing and classification: another common process in all selected libraries. In addition, there are variations for special collections, and

some library management systems allow for the purchase of a record already done, more or less, which saves cataloguing time (and should, theoretically be more accurate).

- Binding: it is an important process that protects books from getting damaged. It also saves space when issues of periodicals are bound in one volume. It was chosen for modelling in this research since it was learnt from interviews with library staff in JO1 that it is a major process with various stages that takes place annually.
- Digitization: this is “a hot topic” as stated by the collection management team leader in UK1. Academic and research libraries have become increasingly interested in using electronic resources and therefore, converting their materials from print into digital format. Mugridge (2006) states that digitization projects are relatively new endeavour for most libraries. There has been a challenge in creating digital material and also in digitizing current print materials.
- Thesis handling: theses play a major role in the educational experience. Many institutions now believe that it is essential to make their research available to other scholars. Handling theses is a very important process as theses are now getting into universities’ digital repositories.

There are other processes that take place in academic libraries, and some processes may be more typical of converged services; some may be more typical of non-converged services. Other processes could have been studied – information literacy process for example – but information literacy programmes are only done in the UK, so it would not be possible to do cross case description and analysis.

The methods used to collect data from the cases were: documentary information, archival records, 47 interviews with library staff to learn about library processes, and direct observation. These were discussed in section 3.6.2. The sampling strategy adopted for selecting library staff to be interviewed from the four cases is derived from Miles and Huberman (1994) framework which introduces a set of criteria to evaluate sampling strategies as

explained in section 3.6.2. The strategy for selecting library staff in this research relates to the second sub-question of this research about processes. The strategy was to select informants from various levels, for instance, managers and standard (front line) employees. The strategy also stresses selecting people that can add value by providing rich information about various library processes and their detailed activities, since the main concern of this research is to improve these processes. Interviewees were asked specific but flexible questions and were also given the chance to propose their insights. Permission was gained from all the library directors for interviews for the research. An information letter explaining the research topic, and a consent form were distributed to members of staff prior to the interview (Appendices 1 and 2). Interviews with library staff in the UK were recorded, however, if recordings were not possible; then notes were taken carefully and written up soon after the interview. The interviews, plus the contextual information obtained, provided all the data required to develop the RADs for the various processes.

Regarding Riva as a modelling method, section 9.2 proved the feasibility of applying Riva as a modelling method in academic libraries. Chapter five introduced the PAD, the first part of Riva approach, which is based upon key entities in the organisation. The PAD divides organisational activities into processes, the right processes. The following steps were the key stages followed for building process architecture as proposed by Ould (2005):

1. Finding the organisation's essential business entities.
2. Identifying the units of work (UOW), these are the EBEs that have a life time that the organisation must handle.
3. Creating a UOW diagram that examines the relationships between the units of work.
4. Hypothesise that each UOW has a case process which deals with a single instance of the UOW, a case management process that deals with the flow of instances, and a case strategy process that determines the future strategy for the case and case management processes (Green and Ould, 2004).

5. Convert the UOW diagram to a process architecture diagram, by turning the relationships between the units of work into relationships between corresponding case and case management processes

The literature provided in section 2.5 emphasised the lack of “big picture” modelling solutions in academic libraries, and that there is little evidence in the literature about modelling done within academic libraries. Riva however introduces the PAD as a solution to this problem. PAD expresses the organisational structure and it usually remains stable if organisations change but stay in the same business. Although there are some difficulties associated with generating the PAD, the literature, personal work experience, observations and the interviews helped in developing the PAD. However, ideally, it might have been useful to do this with the help of a focus group of senior library managers at each site but this was not feasible.

Both PAD and RAD are required if a strategic overview of activities is required. Ould (2005) explains the relationship between the two parts of Riva, and states that it is important to create a PAD to chunk the massive activities undertaken within an organisation and determine what processes it must have. After that, existing processes can be explored and modelled using RAD. The PAD and the RADs did fit together and working top-down (PAD to RAD) and bottom-up (RAD to PAD) helped.

Later in section 10.4, the PAD is regenerated to demonstrate the feasibility of producing a high-level process model applicable to university libraries in general.

### ***10.3 Reflection on results***

RAD offers benefits drawn from large-scale studies, capable of being applied and analysed within small cases. This method also offers an integrity that less explicit modelling does not. RAD was selected as the modelling method as the role perspective was intended to illuminate possible improvements, and the role perspective was claimed to be something that staff could relate to.

Although not every RAD could be verified with the staff involved, those that did have an opportunity to comment found the diagrams easy to understand.

Chapters six, seven and eight provided models of RADs representing the processes selected in attempt to visualize, analyse and improve library processes. Visio 2007 is the drawing tool used to provide the notations that support the RAD. It has been tempting to conclude that, “Business Process Modelling comes to the rescue” (Havey, 2005). The results showed that RAD acts as a searchlight, reveals problems and suggests potential ways of attacking those problems (Ould, 1995). The resulting improvements were based on Ould’s four different styles of improvements: point-wise improvements (such as enhancing communication between some roles and setting a deadline for some activities), flow-wise improvements (such as doing some activities in parallel to save time, and minimizing paper work), improvements by restructuring roles (such as removing unnecessary tasks and moving activities between roles to lower the work load), and the most radical change of realigning the organisation to the process (such as adding new roles).

External factors were considered as well, these were derived from the interviews or from the setting itself, and they affect the quantitative behaviour of the process (Ould, 1995). Examples of such factors are: the number of staff carrying out activities, seasonal work, the availability of tools and other resources needed in some roles, and the economic and currency situation.

In summary, it was possible to do comparative analysis through the RADs provided and it may be useful for academic libraries to work together on BPM as the comparative analysis helps. In this research, comparing the RADs of different libraries was useful – even of those in different countries, for example, it was found that it is good for JO1, compared to UK libraries, to allow online access of theses to students. Although it is probably better to compare libraries with the same mission or culture and allow them to work together on BPM, it could be helpful for libraries in different countries to compare their RADs.

## **10.4 Contribution to the evidence base**

This work has added value to what currently exists in the following areas:

- 1) Operational research in academic libraries. This work has added value to operational research and library processes by providing a clear modelling tool to visualize and improve library processes. Research libraries became interested in the knowledge and skills of operations research practitioners around 1945 and since then, scientific approaches to library operations have been developed. Rau (2007) suggests that operations research provided a basis for the large scale library computerisation projects of the 1980s and 1990s, but there has been little work since then.
- 2) Published work on RAD generally. This research has also added value to the limited published work in this area. As mentioned before, little work has been done in modelling in academic libraries. What is published is mostly small-scale, giving little idea on how such modelling helps to support strategic planning. Such workflow modelling that does exist is hidden in internal records. There is also the consultancy effect, the acknowledgment that Martin Ould (the Riva method developer) is also acting as a management consultant. Reports done by management consultants for organisations may be published, but there is no guarantee that the reports will be published in full, and they may be buried on a part of the website. If nobody finds them and links to them, they become virtually invisible.

Using a tool such as RAD in academic libraries to model processes, adds methodological and practical contributions to the library field. The PAD on the other hand is flexible and can be reproduced to fit new needs or to represent a high-level process model applicable to university libraries in general. To demonstrate that and to prove that PAD is considered a good basis on which changes can be made to fit other needs, the PAD is regenerated in this section to embrace additional units of work, these are “information literacy” and “research support”.

Information literacy was not modelled in this research as it was not considered a process by the library staff interviewed. On the other hand, research support seems to be a priority in UK2 only, since it is an intensive research library. However, as mentioned in section 2.2.1, information literacy is one important aspect that interests SCONUL. For the development of information literate person, SCONUL proposed seven sets of skills developing from a basic competence in library and IT skills, as shown in figure 2.1. "Information literacy is a set of abilities requiring individuals to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information" (ALA, 1989). Bainton (2001) argues that information literacy is a wide concept that embraces information skills and information technology skills. Such a wide concept in higher education reflects twin dimensions of the 'information literate' person and the 'competent student'.

It was mentioned in section 2.4.2 that libraries have changed from being repositories of books, and are now embracing new responsibilities such as more engagement with the educational institutions within which they work, including involvement in educational practices of learning, teaching and research. In the UK, universities support research by providing access to bibliometric tools to help academics and managers work out personal "impact factors" and the total research productivity of the university. Increasingly, bibliometric techniques have been applied in research assessment, by identifying quantitative indicators for academic productivity and quality (Butler, 2011). University libraries may expand their work on digitization and repositories to include management of research data (Lewis, 2011). The term digitization in the PAD is one that increasingly should include the born-digital content, the e-resources of their own institutions.

To fit these two into the PAD, the units of work diagram should be updated before developing the revised PAD. Therefore, two units of work are added, these are: "information literacy programme" and "research support", and they are highlighted in red in figure 10.1. Figure 10.2 then introduces the updated PAD.







According to Ould (2005), the PAD does not change for organisations which stay in the same business. From the above diagram it is demonstrated that it is feasible to update the PAD by adding more nodes as the business requires. A comparison of the themes discussed in the McKnight book helped when assessing how the PAD could be developed further. McKnight (2010) includes topics such as Web 2.0, new forms of publishing, and research data management, under the general theme of the transformation of knowledge practices in academic librarianship. These transformations generate a big-picture commentary that guides practitioners in the field. One dominant theme is to re-invent the means (tasks and workflows) without losing the actual goal (libraries' services). McKnight (2010) believes that "the hitch comes in actually applying - or even knowing - the everyday details necessary to realize this much-vaunted balance". Moreover, Corral (2012b) refers to the particular competency needs for research data management. The author stresses the need to "develop research library staff for working in a data-intensive world", and to re-think about the data-related responsibilities of some roles such as research support staff and subject librarians. Figure 10.2 responds to this and introduces a PAD at a higher level, a more general one that exposes emerging needs and embraces more processes that are currently taking place in university libraries. It takes an architectural view of the processes in university libraries in general. It should be noted that although the term digitization has been retained, arguably the process has become "development and curation of digital assets".

### ***10.5 Limitations and challenges of the research***

Limitations are mainly focused around the methodological approach which is a highly analytical, rational method of examining library processes. The first constraint in this research is that the use of roles in this method ignores the fact that some people stretch a role to its limits, while others are just the "jobsworth" who only do what they have to. As mentioned at the end of section 2.5.1, the single instance of a role could be acted by different people at different times during the life-cycle of the process. Although Ould (2005)

defines a role as a responsibility within a process, which follows certain business rules to carry out actions, there is the problem of interpreting roles, when some activities associated with the job position role are interpreted by different individuals (actors) in different ways. This could affect how library staff view the diagrams. For this reason, it is important to identify the roles clearly, and to separate the role from the productivity of the person fulfilling that role. Unions might need to be reassured that the business process modelling was not merely an attempt to cut staff numbers. BPM could be a lot easier in the private sector where unions are generally less strong.

Another limitation that does not concern the modelling method is the number of processes selected, which are the basic processes in academic libraries. These were selected according to the interviews with library staff and based on the justification provided in section 3.6.1.

One more point to acknowledge in the limitations is the difficulty of using RIVA to totally overturn the way academic libraries operate (as mentioned previously in section 3.3.2). However, by using the PAD, questions might arise about problem areas, but it would only be a start.

Finally, regarding the rational assumptions that need to be made when using Riva, Ould (2005) considers that PAD and RAD are best applied in organisations where entities and roles (respectively) are clearly defined. This means that Riva is best applied in organisations with a bureaucratic structure. Jordan and Tricker (1995) carried out an investigation to examine the alignment of information system strategy to its organisational structure, and this study of twenty five business units in an international bank found that aligning the information strategy with the organisational structure is feasible.

Olorunsola (2000) provided a study that aimed to collect information about libraries as bureaucratic organisation and the views of librarians about the effect of bureaucracies on their professionalism. A further aim was to report results to library managers and staff. Olorunsola (2000) asserts that academic libraries are bureaucratic: "libraries are bureaucracies, having examined some characteristics of bureaucracy and found that libraries rank high on them". Since academic libraries follow bureaucratic organisational structure, roles are

clearly defined (this is true as it was not hard to define them in this research), hence, RAD can be applied.

Mintzberg (1980) divided organisational structure types into five categories, these are: simple structure, machine bureaucracy, professional bureaucracy, divisionalized form, and Adhocracy. In the comparison provided in his article, standardization of work is a key coordinating mechanism in the machine bureaucracy organisational structure configuration, in which the following points characterize this structure: there are routine operating tasks (this makes the definition of roles clear), formalization of behaviour is high, grouping is usually functional, horizontal decentralization is limited and environment complexity is low. In the adhocracy structure however, staff are organised in organic teams – which are usually project-based – to try to solve new problems, mutual adjustment is the key coordinating mechanism with little formalization of behaviour, organisations with adhocracy structure are changing and definition of roles becomes fuzzier. This makes the use of RADs in such organisations less applicable. Roles may not always be well defined, and organisational change might require some periods when new roles need to be worked on. It might be difficult to go from one well defined role to another unless the defined role is split.

Challenges were faced throughout this research, and these were:

- Finding out that there had been some kind of contradiction in some interviews, during the analysis period in particular. Sometimes people within the same organisation contradict each other, for instance, in JO2, I was confused with the binding process, as mentioned in section 8.3, the head of cataloguing and classification said that binding happens occasionally, if the book does not come in hard cover, the head of acquisitions however stated that every book gets bound. It was ascertained in a later visit that binding is rarely done in JO2, according to the assistant director.
- Modelling in academic libraries. As mentioned in section 2.5, there is little evidence in the literature about modelling done within academic libraries. Although some libraries have thought of modelling their

processes, these models are kept as internal records, hence, are hard to find. Looking at published work, JISC do offer some use case diagrams when representing processes in their research reports, for instance, encouraging using use case diagrams for business modelling in two sessions presented in the e-framework modelling workshop (Barn (2007) and Dexter (2007)). As the deployment of e-infrastructure has the potential to increase the efficiency of research in the UK, JISC funded two complementary projects to study the usage of e-infrastructure and any associated obstacles across research communities. Use cases were used to show how users interact with e-infrastructure to achieve research goals (JISC, 2010b). However, there is a big difference between looking at an academic library as a whole, and a simple use case diagram for one process. Although each use case may be detailed in a structured document to view the scenario of the process, followed by an activity diagram to model its flow, use case diagrams are not that suitable for BPM, instead, they are best used to produce requirements specification document, more specifically, a set of functional requirements, “use cases are a valuable tool to help understand the functional requirements of a system” (Fowler, 2003).

- For managers to be able to know details of tasks and how staff organise their time, they need to know how their library works. Modelling should help in getting a big picture of what is going on in an organisation, and this is useful for managers, however, it is still difficult for library managers to know how staff organise their time.
- To add to all this, the steep learning curve required from computer science to library science was a challenge to overcome. I come from a computer science background, and my initial knowledge of librarianship was limited. Although interviews with library staff helped greatly to understand the processes, however, intensive research from my side was also needed. Domain knowledge is not that necessary to do business process modelling and Riva, but the analyst has to work carefully, with continuous checking as they could be faced with variations. For example, I had to provide definitions for the actors for each case and differentiate between multiple names given by the

interviewees for the same actor (such as provider/agent), and that was necessary as there were subtle variations between the cases.

### ***10.6 Recommendations for further research***

- Section 2.4 highlighted the value of BPM in this time when business organisations are being described in terms of processes rather than functional hierarchies. Therefore; it would be useful to find out whether any type of process modelling or analytic investigation techniques are taught in library and information science departments, to assess awareness of BPM as a possible modelling technique to visualize, analyse and document library processes.
- Consideration should be given to extending the work to different universities with different structures to the four case studies, to check that the methods are still applicable. This might be done through an organisation such as SCONUL.
- Discuss trials of using RIVA for analysing processes in some of the work that academic liaison librarians do, and that might be considered to be less well defined.

## References list

- Aguilar, E. R., Ruiz, F., García, F., & Piattini, M. (2006). Evaluation measures for business process models. Paper presented at *the 21st Annual ACM Symposium on Applied Computing*, Dijon, France, April 23-27, 2006. Retrieved May 22, 2009 from the ACM digital library (the Guide).
- Agyen-Gyasi, K. (2008). The need for subject librarians in Ghanaian academic libraries. *Electronic Journal of Academic and Special Librarianship*, 9(3). Retrieved November 29, 2011, from [http://southernlibrarianship.icaap.org/content/v09n03/agyen-gyasa\\_k01.html](http://southernlibrarianship.icaap.org/content/v09n03/agyen-gyasa_k01.html)
- Akeroyd, J. (2001). The future of academic libraries. *Aslib Proceedings*, 53(3), 79-84. Retrieved December 7, 2009, from Emerald database.
- ALA (American Library Association). (1989). *Presidential Committee on Information Literacy: Final Report*. Chicago: ALA.
- Albano, A., Bergamini, R., Ghelli, G., & R. Orsini, R. (1993). An object data model with roles. Proceedings of *the 19th VLDB Conference*, Dublin, Ireland, August 24-27 1993.
- Anjard, R. P. (1998). Total quality management: key concepts. *Work Study*, 47(7), 238-247. Retrieved October 20, 2010, from Emerald database.
- ARL Digital Repository Issues Task Force. (2009). *The research library's role in digital repository services: final report of the ARL digital repository issues task force*. Washington: Association of Research libraries. Retrieved May 26, 2011, from <http://www.arl.org/bm~doc/repository-services-report.pdf>
- Atkinson, J. (2003). Managing change and embedding innovation in academic libraries and information services. *New Review of Academic Librarianship*, 9(1), 25-41. Retrieved June 3, 2008, from Informaworld database.

- Avison, D., & Fitzgerald, G. (2006). *Information systems development: Methodologies, techniques and tools*. Maidenhead, Berkshire: McGraw-Hill.
- Bădică, C., Teodorescu, M., Spahiu, C., & Bădică, A. (2005). Integrating role activity diagrams and Hybrid IDEF for business process modelling using MDA. Paper presented at *the seventh International Symposium on Symbolic and Numeric Algorithms for Scientific Computing*, Timisoara, Romania, 25-29 September 2005. Retrieved December 19, 2009 from IEEE Xplore digital library.
- Bainton, T. (2001). Information literacy and academic libraries: the SCONUL approach (UK/Ireland). Paper presented at *the 67<sup>th</sup> IFLA Council and General Conference*, Boston, USA, 16-25 August 2001. Retrieved January 22, 2012, from <http://archive.ifla.org/IV/ifla67/papers/016-126e.pdf>
- Barn, B. (2007). *Business Process Modelling* [PDF document]. Retrieved May 22, 2011, from [http://www.jisc.ac.uk/media/documents/programmes/eframework/process-modelling\\_balbir\\_barn.pdf](http://www.jisc.ac.uk/media/documents/programmes/eframework/process-modelling_balbir_barn.pdf)
- Barton, J., Blagden, J. (1998). *Academic library effectiveness: a comparative approach*. Boston Spa: British Library Research and Innovation Centre
- Bazin, P., Desmarais, N., & Schuster, J. (2006). Periodicals collection management: organizing, creating, and maintaining a system. *Library Management*, 27(9), 590-599. Retrieved February 8, 2010, from Emerald database.
- Becker, J., & Niehaves, B. (2007). Epistemological perspectives on IS research: a framework for analysing and systematizing epistemological assumptions. *Information Systems Journal*, 17(2), 197-214. Retrieved September 19, 2010, from [http://www.profjayrfigueiredo.com.br/STI\\_AC\\_13.pdf](http://www.profjayrfigueiredo.com.br/STI_AC_13.pdf)



- Beckett, C. (2002). Aggregators: a taxonomy. *Serials*, 15(3), 257-260.  
Retrieved January 8, 2010, from Emerald database.
- Beer, S. (1981). *The Brain of the Firm*. Chichester: Wiley.
- Beeson, I., Green, S., & Kamm, R. (2009). Process architectures in higher education. Paper presented at *the UK Academy for Information Systems Conference*, Oxford, UK, 31 March 2009. Retrieved Jan 23, 2011 from <http://aisel.aisnet.org/cgi/viewcontent.cgi?article=1019&context=ukais2009>
- Beeson, I., Green, S., Sa, J., & Sully, A. (2002). Linking business processes and information systems provision in a dynamic environment. *Information Systems frontiers*, 4(3), 317-329. Retrieved November 20, 2009, from <http://www.cems.uwe.ac.uk/~sjgreen/ISJournal.pdf>
- Bensman, S. J. (2005). Urquhart and probability: the transition from librarianship to library and information science. *Journal of the American Society for Information Science and Technology*, 56(2), 189-214.
- Biddle, B. J., & Thomas, E. J. (Eds.). (1966). *Role Theory: Concepts and Research*. New York: Wiley.
- Bider, I. (2005). Choosing approach to business process modeling - practical perspective. *Journal of Conceptual Modeling*, 34. Retrieved September 4, 2008, from <http://www.inconcept.com/JCM/january2005/IBider.html>
- Blake, V. L. P. (2002). Forging the Anglo-American Cataloguing alliance: descriptive cataloguing, 1830-1908. *Cataloguing & Classification Quarterly*, 35(1), 3-22. Retrieved June 7, 2010, from Informaworld database.
- Blom, B. (2010). Analysing written narratives: considerations on the 'code-totally problems', *Nordic Journal of Social Research*, 1(1), 1-20
- Bond, T. C. (1999). Systems analysis and business process mapping: a symbiosis, *Business Process Management Journal*, 5(2), 164-177.

- Boon, S., Johnston, B., & Webber, S. (2007). A phenomenographic study of English faculty's conceptions of information literacy. *Journal of Documentation*, 63(2), 204-228. Retrieved June 25, 2012, from Emerald database.
- Bordeianu, S., Lewis, L. K., & Wilkinson, F. C. (1998). Merging the acquisitions and serials department at the University of New Mexico: a case study. *Library Acquisitions: Practice & Theory*, 22(3), 259-270. Retrieved February 8, 2010, from ScienceDirect database.
- Boss, S. C., & Schmidt, L. O. (2007). Electronic resources (ER) management in the academic library. *Collection Management*, 32(1-2), 117-140.
- Bradley, J. (1993). Methodological issues and practices in qualitative research, *The Library Quarterly*, 63(4), 431-449. Retrieved January 23, 2009, from JSTOR database.
- Brancolini, K. R. (2000). Selecting research collections for digitization: applying the Harvard model. *Library Trends*, 48(4), 783-798.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77-101
- Brettell, A., & Urquhart, C. (eds.). (In press). *Changing roles and contexts for health library and information professionals*. London: Facet Publishing
- Brindley, L. J. (1994). Joint funding councils' libraries review group (the "Follett") report: The contribution of the information technology sub-committee. *Program: electronic library and information systems*, 28(3), 275-278.
- Brindley, L. J. (2006). Joint funding councils' libraries review group (the "Follett") report: The contribution of the information technology sub-committee. *Program: electronic library and information systems*, 40(4), 311-314

- British Library EThOS (n.d.). *EThOS- Beta: Electronic Theses Online Service*. Retrieved October 21, 2010, from <http://ethos.bl.uk/About.do>
- Brophy, P. (2000a). *The academic library*. London: Library Association Publishing.
- Brophy, P. (2000b). Towards a general model of information and library services in the information age. *Journal of Documentation*, 56(2), 161-184.
- Brophy, P. (2006). *Measuring library performance: principles and techniques*. London: Facet Publishing
- Brophy, P., & Coulling, K. (1996). *Quality management for information and library managers*. Aldershot, Hampshire: Aslib Gower
- Brophy, P., & Wynne, P. (1997). *Management Information Systems and Performance Measurement for the Electronic Library: eLib Supporting Study: (MIEL2): Final Report*. University of Central Lancashire: CERLIM. Retrieved November 16, 2011, from <http://www.ukoln.ac.uk/services/elib/papers/supporting/pdf/mis.pdf>
- Bryan, H. (1976). *University libraries in Britain*. London: Clive Bingley.
- Bryman, A. (2004). *Social Research Methods*. New York: Oxford University Press.
- Burnhill, P., Guy, F., & Osborne, N. (2006). Scholarly communication and national union catalogues: a strategic role for SUNCAT in the UK information environment. *New Review of Information Networking*, 12(1-2), 1-21.
- Butler, L. (2011). *Using bibliometrics to assess university research: the role of librarians*. [PDF document]. Retrieved January 22, 2012, from <http://asia.elsevier.com/asiamailings/LC%20and%20REF/LC%20Malaysia/Linda%20Butler%20->

%20Using%20Bibliometrics%20to%20assess%20university%20research%20(22-02-2011).pdf

- Byamugisha, H. M. (2010). Digitizing library resources for new modes of information use in Uganda. *Library Management*, 31 (1-2), 42-56. Retrieved January 25, 2010, from Emerald database.
- Caetano, A., Ritó Silva, A., & Tribolet, J. (2005). Using roles and business objects to model and understand business processes. Paper presented at *the 2005 ACM symposium on Applied computing*, Santa Fe, New Mexico, 3-6 January 2005. Retrieved May 22, 2009 from the ACM digital library.
- Caetano, A., Zacarias, M., Silva, A., & Tribolet, J. (2005). A role-based framework for business process modeling. Paper presented at *the 38<sup>th</sup> 2005 Hawaii International Conference on System Science*, Big Island, HI, January 3-6 2005. Retrieved May 22, 2009, from ACM digital library (the Guide).
- Calhoun, B. D. (2004). Using the balanced scorecard to determine corporate information needs. Retrieved August 22, 2010, from <http://www.designbydi.com/documents/BalScrCrd.pdf>
- Carey, R., Elfstrand, S., & Hijleh, R. (2005). An evidence-based approach for gaining faculty acceptance in a serials cancellation project. *Collection Management*, 30(2), 59-72. Retrieved May 4, 2009, from Informaworld database.
- Carnoy, M. (2005). Globalization, educational trends and the open society. Paper presented at *the Open Society Institute Education Conference: Education and open society, a critical look at new perspectives and demands*, Budapest, Hungary, June 30 - July 2, 2005.
- Carroll, J., & Brink, J. (2006). Changing the access from subscription to article in the academic library: using Infotrieve as one of the solutions to the journal problem. *Collection Management*, 31(3), 3-13. Retrieved February 11, 2010, from Informaworld database.

- Cauvet, C., & Guzelian, G. (2008). Business process modeling: a service-oriented approach. Proceedings of *the 41<sup>st</sup> Hawaii International Conference on System Science*, Big Island, HI, January 7-10 2008. Retrieved December 24, 2009, from IEEE Computer Society.
- Ceynowa, K. (2000). Managing academic information provision with the balanced scorecard: a project of the German Research Association. *Performance Measurement and Metrics*, 1(3), 157-164. Retrieved August 21, 2010, from Emerald database.
- Chadwell, F. A. (2009). What's next for collection management and managers? User-centred collection management. *Collection Management*, 34(2), 69-78. Retrieved May 5, 2009, from Informaworld database.
- Chaturvedi, D. (Ed.). (1994). *Academic Libraries*. New Delhi: Anmol publications.
- Chen, W. S., & Hirschheim, R. (2004). A paradigmatic and methodological examination of information systems research from 1991 to 2001. *Information Systems Journal*, 14(3), 197-235. Retrieved 19, September, 2010, from <http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2575.2004.00173.x/pdf>
- Chen, C-C., & Chen, Y-T. (2009). A Study on Taiwanese Readers' Preference of Book Binding Design. Paper presented at *the IASDR 2009: Rigor and relevance in design*, Korea, October 18-22. Retrieved January 25, 2009, from <http://www.iasdr2009.org/ap/navigation/bytitle.html>
- Choi, Y., & Rasmussen, E. (2009). What qualifications and skills are important for digital librarian positions in academic libraries? A job advertisement analysis. *Journal of Academic Librarianship*, 35(5), 457-467
- Chowdhury, K. R. (2008). Information retrieval from digital libraries using probabilistic – possibilistic inferences. Paper presented at *the 6<sup>th</sup> international CALIBER: From automation to transformation*, Allahabad, India, February 28 – March 1, 2008. Retrieved May 23, 2011, from

<http://shodhganga.inflibnet.ac.in/dxml/bitstream/handle/1944/1225/24.pdf?sequence=1>

CILIP. (2012). *The Body of Professional Knowledge and Skills draft for consultation*. Retrieved June 30, 2012, from <http://www.cilip.org.uk/about-us/future-skills-project/Pages/bpks-consultation.aspx>

Cogswell, J. A. (1987). The organisation of collection management functions in academic research libraries. *Journal of Academic Librarianship*, 13(5), 268-276.

Collis J., & Hussey R. (1997). *Business Research: A practical Guide for Undergraduate and Postgraduate Students*. Basingstoke, Hampshire: Palgrave Macmillan.

Consejo Superior de Investigaciones Científicas (CSIC). (2012). Webometrics Ranking of World Universities. Retrieved February 28, 2012, from [http://www.webometrics.info/top100\\_continent.asp?cont=aw](http://www.webometrics.info/top100_continent.asp?cont=aw)

Conyers, A., & Dalton, P. (2007). Electronic resource measurement: linking research to practice. *The Library Quarterly*, 77(4), 463-470. Retrieved December 7, 2009, from <http://www.journals.uchicago.edu/doi/abs/10.1086/521087>

Cook, C., Heath, F., & Thompson, B. (2001). Users' hierarchical perspectives on library service quality: A "LibQUAL+™" study. *College and Research Libraries*, 62(2), 147-153.

Cook, C., Thompson, B., & Kyrillidou, M. (2010). Does using item sampling methods in library service quality assessment affect score norms?: LibQUAL+® lite study. Paper presented at *the 2<sup>nd</sup> qualitative and quantitative methods in libraries (QQML) international conference*, Chania (Crete), Greece, May 25-28, 2010.

- Cooper, R. & Norris, D. (2007). To bin or not to bin? Deselecting print back-runs available electronically at Imperial College London. *The Journal for the Serials Community*, 20(3), 208-214
- Corrall, S. (1995). Academic libraries in the information society. *New Library World*, 96(3), 35-42. Retrieved December 7, 2009, from Emerald database.
- Corrall, S. (2012a). The concept of collection development in the digital world. In M. Fieldhouse & A. Marshall (Eds.), *Collection development in the digital age*. London: Facet Publishing.
- Corrall, S. (2012b). *Skills which librarians need... Are libraries and schools ready to meet these new demands?* [PowerPoint]. Retrieved June 24, 2012, from <http://www.rluk.ac.uk/content/clarifying-roles-libraries-research-data-management-discussion-day-find-creative-solutions>
- Corrall, S., & Keates, J. (2011). The subject librarian and the virtual learning environment: a study of UK universities. *Program*, 45(1), 29-49.
- Cox, K., & Phalp, K. (2003). From process model to problem frame. Paper presented at *the 9th international workshop on requirements engineering: foundation for software quality - REFSQ'03*, Velden, Austria. Retrieved December 24, 2009, from <http://crinfo.univ-paris1.fr/REFSQ/03/papers/P10-Cox.pdf>
- Coyle, K., & Hillmann, D. (2007). Resource Description and Access (RDA): cataloguing rules for the 20<sup>th</sup> century. *D-Lib Magazine*, 13(1/2).
- Creswell, J. (1994). *Research Design, Qualitative and Quantitative Approaches*. London: Sage Publications.
- Creswell, J. W., & Plano Clark, V. L. (2007). *Designing and Conducting Mixed Methods Research*. Thousand Oaks, CA: Sage Publications.

- Cribb, G., & Hogan, C. (2003). Balanced scorecard: linking strategic planning to measurement and communication. Paper presented at *the 24<sup>th</sup> Annual IATUL Conference*, Ankara, Turkey, June 2-5 2003.
- Crowley, P. (2006). Graffletopia: Stencils for OmniGraffle. Retrieved February 2, 2010, from <http://graffletopia.com/stencils/140>
- Cullen, R. (1998). Measure for measure: a post modern critique of performance measurement in libraries and information services. Paper presented at *the International Association of Technological University Libraries*, Pretoria, South Africa, June, 1-5 1998. Retrieved August 22, 2010, from <http://www.eric.ed.gov/PDFS/ED434664.pdf>
- Curtis, B., Kellner, M., & Over, J. (1992). Process modeling. *Communications of the ACM*, 35(9), 75-90.
- Curtis, S., Gesler, W., Smith, G., & Washburn, S. (2000). Approaches to sampling and case selection in qualitative research: examples in the geography of health. *Social Science & Medicine*, 50, 1001-1014.
- Cyburt, R. H., Austin, S. M., Beers, T. C., Estrade, A., Ferguson, R. M., Sakharuk, A., Schatz, H., Smith, K., & Warren, S. (2010). The Virtual Journals of the Joint Institute for Nuclear Astrophysics. *D-Lib Magazine*, 16(1/2). Retrieved May 9, 2011, from <http://www.dlib.org/dlib/january10/cyburt/01cyburt.html>
- Dale, P., & Cheshir, K. (2009). Collaboration between librarians and learning technologists to enhance the learning of health sciences students. *New Review of Academic Librarianship*, 15(2), 206-218.
- Daneshgar, F., & Parirokh, M. (2007). A knowledge schema for organisational learning in academic libraries. *Knowledge Management Research and Practice*, 5(1), 22-33. Retrieved June 18, 2008, from ABI/Inform database.



- Davies, A., Kirkpatrick, I., & Oliver, N. (1992). The organisational culture of an academic library: Implications for library strategy. *British Journal of Academic Librarianship*, 7(2), 69-89.
- Dawkins, S. (1998). Role activity diagrams for safety process definition. Paper presented at *the 16th International System Safety Conference*, Seattle, WA.
- Denzin, N. K. (1970). *The Research Act in Sociology*. Chicago, IL: Aldine.
- De Vaus, D. (2002). *Surveys in Social Research*. London: Routledge.
- Dew, P. M., Schmidt, J. G., Thompson, M., & Morris, P. (2003). The White Rose Grid: practice and experience. Retrieved February 28, 2012, from [www.nesc.ac.uk/events/ahm2003/AHMCD/pdf/031.pdf](http://www.nesc.ac.uk/events/ahm2003/AHMCD/pdf/031.pdf)
- Dexter, H. (2007). *Managing requirements through to service specification* [PowerPoint]. Retrieved May 22, 2011, from [http://www.jisc.ac.uk/media/documents/programmes/eframework/transition\\_models\\_working\\_systems\\_hilary\\_dexter.pdf](http://www.jisc.ac.uk/media/documents/programmes/eframework/transition_models_working_systems_hilary_dexter.pdf)
- Dorner, D. G. (2004). The impact of digital information resources on the roles of collection managers in research libraries. *Library Collections, Acquisitions, and Technical Services*, 28(3), 249-274. Retrieved February 9, 2010, from ScienceDirect database.
- Dougherty, R. M. (2008). *Streamlining Library Services: What we do, how much it takes, what it costs, how we can do it better*. Lanham, MD: Scarecrow Press.
- Dugan, R. E. (1999). Information policy and technology partners. *Journal of Academic Librarianship*, 25(6), 482-483. Retrieved May 22, 2010, from EBSCO.
- Easterby-Smith, M., Thorpe, R., & Lowe, A. (2002), *Management Research: An Introduction*. London: Sage Publications.

- Edmonds, D. (2010). Outsourcing in public libraries: placing collection management in the hands of a stranger? In M. Fieldhouse & A. Marshall (Eds.), *Collection development in the digital age*. London: Facet Publishing.
- Ehrlich, K. & Cash, D. (1999). The invisible world of intermediaries: a cautionary tale. *Computer Supported Cooperative Work*, 8(1-2), 147-167.
- Ellis, D. (1993). Modelling the information-seeking patterns of academic researchers: a grounded theory approach. *The Library Quarterly*, 63(4), 469-486. Retrieved January 23, 2009, from JSTOR database.
- Enser, P. (2002). The role of professional body accreditation in library & information science education in the UK. *Libri*, 52(4), 214–219.
- ESRC. (2010). *The Framework for Research Ethics*. Retrieved September 15, 2010, from [http://www.esrcsocietytoday.ac.uk/ESRCInfoCentre/Images/Framework%20for%20Research%20Ethics%202010\\_tcm6-35811.pdf](http://www.esrcsocietytoday.ac.uk/ESRCInfoCentre/Images/Framework%20for%20Research%20Ethics%202010_tcm6-35811.pdf)
- Estelle, L. (2011). Untrammelled Access: what is the business models for e-books?. Paper presented at *the ANKOS Annual Meeting*, Mugla, Turkey, April 28 - May 1, 2011. Retrieved May 23, 2011, from <http://2011.ankos.gen.tr/tr/sunumlar/Lorraine%20ESTELLE.ppt>
- Estelle, L., & Woodward, H. (2009). *The digital landscape*. Paper presented at *the CLIP Conference "What Future for Digital Information: Order or Anarchy"*, London, November, 17, 2009.
- Falconer, D.J., & Mackay, D.R. (1999). Ontological problems of pluralist research methodologies. Proceedings of *the 5th Americas Conference on Information Systems AMCIS*, Milwaukee, WI, USA, August 13-15 1999.
- Feldmann, L. (2006). Subject librarians in the changing academic library. *Electronic Journal of Academic and Special Librarianship*, 7(3).

Retrieved November 30, 2011, from

[http://southernlibrarianship.icaap.org/content/v07n03/feldmann\\_l01.htm](http://southernlibrarianship.icaap.org/content/v07n03/feldmann_l01.htm)

Ferreira, M., Rodrigues, E., Baptista, A. A., & Saraiva, R. (2008). Carrots and sticks: some ideas on how to create a successful institutional repository. *D-Lib Magazine*, 14(1/2). Retrieved June 10, 2011, from <http://repositorium.sdum.uminho.pt/bitstream/1822/7639/1/Carrots%20and%20Sticks.pdf>

Fowler, M. (2003). *UML Distilled Third Edition: A Brief Guide to the Standard Object Modelling Language*. Redwood city, CA: Addison Wesley.

Gannon-Leary, P., Bent, M., & Webb, J. (2007). Researchers and their information needs: a literature review. *New Review of Academic Librarianship*, 13(1-2), 51-69. Retrieved June 18, 2008, from Informaworld database.

Gannon-Leary, P., Bent, M., & Webb, J. (2008). A destination or a place of last resort? The research library of the future, its users and its librarians. *Library and Information Research*, 32(101), 3-14. Retrieved May 10, 2011, from Directory of Open Access Journal.

Germano, W. (2008). *Getting it Published: A Guide for Scholars and Anyone Else Serious about Serious Books*. Chicago, IL: The University of Chicago Press. Retrieved January 8, 2010, from <http://www.press.uchicago.edu/Misc/Chicago/288447.html>

Gleason, M. L., & Zeugner, L. A. (1998). Ways of change: an acquisitions department in the 1990s. *Library Acquisitions: Practice & Theory*, 22(3), 303-309. Retrieved February 11, 2010, from ScienceDirect database.

Godfrey, M. W. (2007). My little UML (tools) page. Retrieved February 2, 2010, from <http://plg.uwaterloo.ca/~migod/uml/>

Gorman, M. (2002). Why teach cataloguing and classification?. *Cataloguing & Classification Quarterly*, 34(1), 1-13. Retrieved June 7, 2010, from Informaworld database.

- Green, S. (2004). *Requirements Engineering: Process Architectures* [Lecture notes]. Bristol: UWE.
- Green, S., Beeson, I., & Kamm, R. Process architectures and process models: opportunities for reuse. Paper presented at *the 8<sup>th</sup> workshop of Business Process Modelling, Development and Support (BPMDs'07)*, Trondheim, Norway, June, 11-12, 2007. Retrieved April 20, 2011, from [lams.epfl.ch/conference/bpmds07/program/Green\\_34.pdf](http://lams.epfl.ch/conference/bpmds07/program/Green_34.pdf)
- Green, S., & Ould, M. (2004). *The Primacy of Process Architecture*. Retrieved January 13, 2010, from <http://www.cems.uwe.ac.uk/~sjgreen/paper2.pdf>
- Gross, N., McEachern, A. W., & Mason, W. S. (1958). Role Conflict and its Resolution. In B. J. Biddle & E. J. Thomas (Eds.), *Role Theory: Concepts and Research* (pp. 287-296). New York: Wiley.
- Guarino, N., Carrara, M. & Giaretta, P. (1994). An Ontology of Meta-Level Categories. Proceedings of *the Fourth International Conference (KR94) on Knowledge Representation and Reasoning*, San Mateo, CA: Morgan Kaufmann.
- Guise, J. L. (2005). Toward a template for systematic reference and instruction programme analysis. *New Library World*, 106(1-2), 29-42. Retrieved December 7, 2009, from Emerald database.
- Guri-Rosenblit, S., Šebková, H., & Teichler, U. (2007). Massification and Diversity of Higher Education Systems: Interplay of Complex Dimensions. *Higher Education Policy*, 20(4), 373-389.
- Haddow, G. (2008). Self-archiving to institutional repositories is improved by assisted and mandated deposit; disciplinary culture is not a factor. *Evidence Based Library and Information Practice*, 3(2), 52-57
- Hale-Haniff, M., & Pasztor A. (1999). Co-constructing subjective experience: A constructive approach, dialogues in psychology, 16.0. Paper presented at *the Mind-4 conference*, Dublin, Ireland. Retrieved

December 9, 2009, from <http://users.cis.fiu.edu/~pasztora/co-constr/coconstr2.html>

Hammer, M., & Champy, J. A. (2003). *Reengineering the Corporation: A Manifesto for Business Revolution*. NY: Harper Collins.

Hardy, G. (2005). *The role of the subject librarian in the UK universities*. Retrieved November 30, 2011, from [http://dagda.shef.ac.uk/dissertations/200405/External/Hardy\\_Georgina\\_MALib.pdf](http://dagda.shef.ac.uk/dissertations/200405/External/Hardy_Georgina_MALib.pdf)

Harris, B. (2000, fall). Facilitating Process Modelling. *The Facilitator*. Retrieved September 3, 2010, from <http://facilitatedsystems.com/fpm/pdf>

Harris, S. (2011). Bringing e-books resources together. *Research Information*. Retrieved, May 23, 2011, from [http://www.researchinformation.info/features/feature.php?feature\\_id=316](http://www.researchinformation.info/features/feature.php?feature_id=316)

Hart, L. (2001). Comparing ourselves: using benchmarking techniques to measure performance between academic libraries, Report of the LIRG seminar: The effective academic library. *Library and Information Research News*, 25(80), 23-34. Retrieved October 21, 2010, from <http://www.lirg.org.uk/lir/pdf/article80c.pdf>

Havey, M. (2005). *Essential Business Process Modelling*. Sebastopol, CA: O'Reilly.

Hayes, H., & Kent, P. G. (2010). Knowledge management, universities and libraries. In S. McKnight (Ed.), *Envisioning Future Academic Library Services: initiatives, ideas and challenges* (pp. 119-144). London: Facet publishing.

Hepworth, M. (2000). Approaches to providing information literacy training in higher education: challenges for librarians. *New Review of Academic Librarianship*, 6(1), 21-34. Retrieved December 7, 2009, from Informaworld database.

- HEA. (2010). *Benchmarking phase pilot institutions*. Retrieved October 15, 2010, From [http://www.heacademy.ac.uk/resources/detail/ourwork/learningandtech/elearning\\_benchmarking\\_pilot\\_institutions](http://www.heacademy.ac.uk/resources/detail/ourwork/learningandtech/elearning_benchmarking_pilot_institutions)
- HEFCE. (1993a). *Joint Funding Council's Libraries Review Group: Report* (Chairman: Sir Brian Follett). Bristol: HEFCE. Retrieved August 24, 2010, from <http://www.ukoln.ac.uk/services/papers/follett/report/>
- HEFCE. (1993b). *Supporting expansion: a report on human resource management in academic libraries for the Joint Funding Council's Libraries Review Group*. Bristol: HEFCE.
- HEFCE. (2011). *Research Excellence Framework*. Retrieved April 27, 2011, from <http://www.hefce.ac.uk/research/ref/>
- Hiller, S., Kyrillidou, M., & Self, J. (2008). When the evidence is not enough: organisational factors that influence effective and successful library assessment. *Performance Measurement and Metrics*, 9(3), 223-230. Retrieved October 12, 2011, from Emerald database.
- Hirschheim, R., & Klein, H.K. (1989). Four paradigms of information systems development. *Communications of the ACM*, 32(10), 1199–1216
- Hodkinson, P., & Hodkinson, H. (2001). The strengths and limitations of case study design research. Paper presented at *the Learning and Skills Development Agency Conference: Making an Impact on Policy and Practice*, Cambridge, UK, December, 5-7, 2001.
- Hoerman, H. L. (2002). Why does everybody hate cataloguing?. *Cataloguing & Classification Quarterly*, 34(1), 29-39. Retrieved June 7, 2010, from Informaworld database.
- Hogenaar, A. (2009). Enhancing scientific communication through aggregated publications environments. *Ariadne*, (61). Retrieved June 10, 2011, from <http://www.ariadne.ac.uk/issue61/hogenaar/>

- Hopf, R., Litman, D., Pratsch, L., Ustad, I., Welch, R., Tychan, T., and Denett, P. (2004). Guide to a balanced scorecard performance management methodology: moving from performance measurement to performance management. Retrieved October 2, 2011, from <http://energy.gov/sites/prod/files/maprod/documents/BalancedScorecardPerfAndMeth.pdf>
- Hosoi, M. (2005). Motivating employees in academic libraries in tough times. Paper presented at *the ACRL 12<sup>th</sup> National Conference on Currents and Convergence: Navigating the Rivers of Change*, Minneapolis, Minnesota, April, 7-10, 2005. Retrieved February 10, 2011, from <http://www.ala.org/ala/mgrps/divs/acrl/events/pdf/hosoi05.pdf>
- Houlihan, R. (2005). The academic library as congenial space: more on the St Mary's experience. *New Library World*, 106(1-2), 7-15. Retrieved Aug 18, 2008, from Emerald database.
- Huckvale, T. & Ould, M. (1994). Process Modelling: Why, What & How. In K. Spurr, P. Layzell, L. Jennison & N. Richards (Eds.), *Software Assistance for Business Re-engineering* (pp. 81-97). New York: Wiley.
- Hughes, L. M. (2004). Digitizing collections: strategic issues for the information manager. In M. Deegan & S. Tanner (Eds.), *Digital Preservation (Digital Future Series)* (pp. 327-344). London: Facet Publishing.
- Hunn, R. A., Elliott, A. C., & Town, J. S. (2005). Benchmarking of online information literacy tutorials to identify lessons learnt and best practice. Paper presented at *the 6<sup>th</sup> Northumbria International Conference on Performance Measurement in Libraries and Information Services*, Durham, August 22-25, 2005. Retrieved October 14, 2010, from [https://dspace.lib.cranfield.ac.uk/bitstream/1826/949/3/Benchmarking\\_of\\_Online\\_Information\\_Literacy\\_Tutorials-2005.pdf](https://dspace.lib.cranfield.ac.uk/bitstream/1826/949/3/Benchmarking_of_Online_Information_Literacy_Tutorials-2005.pdf)
- Hunt, S. (2010). Improving performance in cataloguing and technical services workflows. Paper presented at *the CIG conference*, Exeter, September

13-15, 2010. Retrieved June 10, 2011, from <http://www.cilip.org.uk/get-involved/special-interest-groups/cataloguing-indexing/Documents/CIG%20Conference%202010/2010HuntS.pdf>

Huvila, I. (2006). *The Ecology of Information Work – A case study of bridging archaeological work and virtual reality based knowledge organisation*. (Doctoral dissertation). Abo: Abo Akademi University Press.

Huvila, I. (2008). Work and work roles: a context of tasks. *Journal of Documentation*, 64(6), 797-815.

Index to Theses. (2011). Index to theses FAQ. Retrieved April 27, 2011, from <http://www.theses.com/faq.asp>

Jacobs, N., Thomas, A., & McGregor, A. (2008). Institutional repositories in the UK: the JISC approach. *Library Trends*, 57(2), 124-141. Retrieved April 27, 2011, from <http://ie-repository.jisc.ac.uk/312/>

Jeal, Y. (2005). Re-engineering customer services: university of Salford information services division. *New Library World*, 106(7-8), 352-362. Retrieved February 8, 2012, from Emerald database.

JISC. (2010a). *Digital Repositories programme 2005-7*. Retrieved April 24, 2011, from [www.jisc.ac.uk/whatwedo/programmes/digitalrepositories2005.aspx](http://www.jisc.ac.uk/whatwedo/programmes/digitalrepositories2005.aspx)

JISC. (2010b). *E-infrastructure programme 2007-9*. Retrieved May 22, 2011, from <http://www.jisc.ac.uk/whatwedo/programmes/einfrastructure/eius.aspx>

JISC. (2010c). *Repositories and preservation programme*. Retrieved April 27, 2011, from <http://www.jisc.ac.uk/whatwedo/programmes/reppres.aspx>

JISC. (2010d). *Repositories support project*. Retrieved April 27, 2011, from <http://www.jisc.ac.uk/whatwedo/programmes/reppres/repssupport.aspx>

JISC. (2011a). *E-research*. Retrieved June 6, 2011, from <http://www.jisc.ac.uk/whatwedo/themes/eresearch.aspx>



- JISC. (2011b). *Information environment programme*. Retrieved June 6, 2011, from <http://www.jisc.ac.uk/whatwedo/programmes/inf11.aspx>
- JISC. (2011c). *Resources discovery programme*. Retrieved June 6, 2011, from <http://www.jisc.ac.uk/whatwedo/programmes/resourcediscovery.aspx>
- JISC Advance. (2011). *Achieving solutions through technology: JISC RSC Impact Report, academic year 2010-2011*. Retrieved January 21, 2012, from [http://www.jiscrsc.ac.uk/media/97109/rsc\\_impact\\_report\\_2011.pdf](http://www.jiscrsc.ac.uk/media/97109/rsc_impact_report_2011.pdf)
- Johnson, E. D. (1970). *History of libraries in the western world*. Metuchen, New Jersey: Scarecrow.
- Joint, N. (2006). Institutional repositories, self-archiving and the role of the library. *Library Review*, 55(2), 81-84. Retrieved 9 February, 2012, from <http://strathprints.strath.ac.uk/2367/>
- Jordan, E., & Tricker, B. (1995). Information strategy: alignment with organisation structure. *Journal of Strategic Information System*, 4(4), 357-382. Retrieved June 11, 2011, from ScienceDirect database.
- Juntunen, A., Ovaska, T., Saarti, J., & Salmi, L. (2005). Managing library processes: collecting data and providing tailored services to end-users. *Library Management*, 26(8-9), 487-493. Retrieved August 13, 2008, from ABI/Inform database.
- Kahn, R. L., Wolfe, D. M., Quinn, R. P., Sonek, J. D., & Rosenthal, R. A. (1964). Adjustment to Role Conflict and Ambiguity in Organisations. In B. J. Biddle & E. J. Thomas (Eds.), *Role Theory: Concepts and Research* (pp. 277-282). New York: Wiley.
- Kaplan, R. S., & Norton, D. P. (2001). Transforming the balanced scorecard from performance measurement to strategic management: part II. *Accounting Horizons*, 15(2), 147-160. Retrieved October 2, 2011, from <http://www.qa.au.edu/page2/research/BSCTranslatingBSCPerfMgtToStrategicMgtPt2.pdf>

- Kassarjian, H. H. (1977). Content analysis in consumer research. *Journal of consumer research*, 4(1), 8-18. Retrieved October 20, 2011, from JSTOR database.
- Kavakli, V., & Loucopoulos, P. (1999). Goal-driven business process analysis application in electricity deregulation. *Information Systems*, 24(3), 187-207. Retrieved January 13, 2010, from ScienceDirect database.
- Kennedy, M. R. (2005). Reformatting preservation departments: the effect of digitization on workload and staff. *College and Research Libraries*, 66(6), 543-551. Retrieved December 7, 2009, from <http://www.pla.org/ala/mgrps/divs/acrl/publications/crljournal/2005/nov/kennedy05.pdf>
- Kettunen, J. (2007). The strategic evaluation of academic libraries. *Library Hi-Tech*, 25(3), 409-421. Retrieved December 7, 2009, from Emerald database.
- Key Perspectives Ltd, & UCL Library Services. (2006). *Evaluation of options for a UK electronic thesis service: study report*. Retrieved April, 23, 2011, from <http://www.keyperspectives.co.uk/openaccessarchive/reports/EThOS%20Report%20-%20final%20published%20version.pdf>
- Khan, Z. A., Odeh, M., & McClatchey, R. (2006). Digital libraries: from process modelling to grid-based service oriented architecture. Paper presented at *the 2nd international conference on Information and Communication Technologies from Theory to Application (ICTTA06)*, Damascus, Syria, April 24-28, 2006. Retrieved 22 May, 2009, from <http://arxiv.org/ftp/cs/papers/0602/0602082.pdf>
- Khan, Z. A., Odeh, M., & Solomonides, T. (2006). Process architecture for digital libraries using Riva and Role Activity Diagramming. Paper presented in *the 7<sup>th</sup> International Arab Conference on Information Technology*, Yarmouk University, Irbid, Jordan, April, 2006.

- King, N. (1998). Template analysis. In C. Cassell & G. Symon (Eds.), *Qualitative Methods and Analysis and Organisational Research* (pp. 118-134). London: Sage.
- Kiviniemi, V., Laitinen, M., & Saarti, J. (2009). Are libraries worth investing in? Finnish university libraries and their effect on the national economy. *Liber Quarterly*, 19 (1).
- Kock, N., & McQueen, R. (1996). Product flow, breadth and complexity of business processes: An empirical study of 15 business processes in three organisations. *Business Process Re-engineering and Management Journal*, 2(2), 8-22.
- Kueng, P., & Kawalek, P. (1997). Process models: a help or a burden?. Proceedings of *the Americas Conference for Information Systems AIS'97*, Indianapolis, USA. August 15-17, 2006. Retrieved January 22, 2009, from <http://citeseerx.ist.psu.edu>
- Kulp, C., & Rupp-Serrano, K. (2005). Organisational approaches to electronic resource acquisitions: decision-making models in libraries. *Collection Management*, 30(4), 3-29. Retrieved February 8, 2010, from Informaworld database.
- Kyrillidou, M. (2010). The ARL library scorecard pilot: using the balanced scorecard in research libraries. *Research Library Issues*, (271), 36–40. Retrieved June 6, 2011, from <http://www.arl.org/resources/pubs/rli/archive/rli271.shtml>.
- Kyrillidou, M., Cook, C., & Lincoln, Y. (2009). Digital library service quality: what does it look like?. In G. Tsakonas & C. Papatheodorou (Eds.), *Evaluation of Digital Libraries: an insight into useful applications and methods* (pp. 187-214). Oxford: Chandos Publishing.
- Laeven, H., & Smit, A. (2003). A project to benchmark university libraries in the Netherlands. *Library Management*, 24(6-7), 291-304. Retrieved August 13, 2008, from ABI/Inform database.

- Lakos, A. (2007). Evidence-based library management: the leadership challenge. *Portal: Libraries and the Academy*, 7(4), 431-450.
- Lancaster, F. W. & Cleverdon, C. W. (1977). *Evaluation and scientific management of libraries and information centres*. Leyden, MA: Noordhoff.
- Law, D. (1997). National library initiatives: the UK higher education experience. *Journal of Academic Librarianship*, 23(2), 127-131. Retrieved December 7, 2009, from EBSCO.
- Lewis, D. W. (2007). A strategy for academic libraries in the first quarter of the 21st century. *College and Research Libraries*, 68(5), 418-434. Retrieved December 7, 2009, from <http://www.ala.org/ala/mgrps/divs/acrl/publications/crljournal/2007/sep/Lewis07.pdf>
- Lewis, M. J. (2011). Libraries and the management of research data. In S. McKnight (Ed.), *Envisioning Future Academic Library Services: initiatives, ideas and challenges*. (pp. 145-168). London: Facet publishing.
- Lewis, N. (2001). Redefining roles: developing an electronic journals collection at the University of East Anglia. *Information Services and Use*, 21(3-4), 181-187. Retrieved December 7, 2009, from EBSCO.
- Lewis, S. (2006). *JISC development programmes, Repository Bridge: Final Report* (No. v1a). Retrieved June 1, 2011, from [http://www.jisc.ac.uk/media/documents/programmes/digitalrepositories/repository\\_bridge\\_final\\_report.pdf](http://www.jisc.ac.uk/media/documents/programmes/digitalrepositories/repository_bridge_final_report.pdf).
- Lin, F-R., Meng-Chyn, Y. & Pai, Y-H. (2002). A generic structure for business process modelling. *Business Process Management Journal*, 8(1), 19-41.
- List, B., & Korherr, B. (2006). An evaluation of conceptual business process modelling languages. Paper presented at *the 21st Annual ACM*

*Symposium on Applied Computing*, Dijon, France, April 23-27, 2006.  
Retrieved May 22, 2009, from the ACM digital library (the Guide).

Litwin, P. (1995). Fundamentals of relational database design. Paper presented at *the Microsoft TechEd conference*, North America, 1995.  
Retrieved August 31, 2010, from  
[http://www.nuigalway.ie/bis/mlang/lecture\\_notes/databases/Fundamentals\\_of\\_Relational\\_Database\\_Design.pdf](http://www.nuigalway.ie/bis/mlang/lecture_notes/databases/Fundamentals_of_Relational_Database_Design.pdf)

Liu, K., Alderson, A., & Qureshi, Z. (1999). Requirements recovery from legacy systems by analyzing and modelling behaviour. Paper presented at *the 15<sup>th</sup> IEEE International Conference on Software Maintenance*, Oxford, England, August 30-September 3, 1999. Retrieved May 23, 2009, from IEEE Computer Society.

Lukes, R. (2008). *Indiana University Kokomo Library Assessment Report for 2007-2008*. Retrieved February 19, 2010, from  
<http://legacy.iuk.edu/~koctla/assessment/SumLib.shtml>

Lunn, K., Sixsmith, A., Lindsay, A., & Vaarama, M. (2003). Traceability in requirements through process modelling, applied to social care applications. *Information and Software Technology*, 45(15), 1045-1052.  
Retrieved January 13, 2010 from ScienceDirect database.

Luo, W., & Tung, A. (1999). A framework for selecting business process modeling methods. *Industrial Management & Data Systems*, 99(7), 312-318.

Lynch, B. P., & Smith, K. R. (2001). The changing nature of work in academic libraries. *College and Research Libraries*, 62(5), 407-420. Retrieved December 28, 2009, from  
<http://www.ala.org/ala/mgrps/divs/acrl/events/pdf/lynch99.pdf>

Lynn, V. A., FitzSimmons, M., & Robinson, C. K. (2011). Special report: symposium on transformational change in health sciences libraries: space, collections and roles. *Journal of the Medical Library Association*,

99(1), 82-87. Retrieved May 10, 2011, from Directory of Open Access Journals.

MacDougall, A., OFarrell, J., & Williams, J. (1997). *EQLIPSE Evaluation and Quality in Library Performance: System for Europe: Final report* (No. 7). Dublin, Ireland: Dublin City University/Dynix

Maclean, R. (1994). *Analysing systems: determining requirements for object oriented development*. New York: Prentice Hall.

Madarash-Hill, C. (2005). The use of JSTOR aggregator titles in an academic library. *Louisiana Library*, 68(2), 3-8. Retrieved June 10, 2011, from [http://www.lsu.com/ocsweb/louishome.nsf/\\$Content/Bibliography/\\$File/Use%2Bof%2BJSTOR\\_Louisiana%2BLibraries\\_Fall2005.pdf](http://www.lsu.com/ocsweb/louishome.nsf/$Content/Bibliography/$File/Use%2Bof%2BJSTOR_Louisiana%2BLibraries_Fall2005.pdf)

Malhotra, Y. (2005). Integrating knowledge management technologies in organisational business processes: getting real time enterprises to deliver real business performance. *Journal of Knowledge Management*. 9(1), 7-28. Retrieved August 15, 2008, from Emerald database.

Markey, K. (2007). The Online Library Catalogue: paradise lost and paradise found. *D-Lib Magazine*, 13(1-2). Retrieved June 6, 2010, from <http://www.dlib.org/dlib/january07/markey/01markey.html>

Marshall, S. (2005). Determination of New Zealand Tertiary Institution E-learning Capability: an application of an e-learning Maturity Model. Retrieved October 15, 2010, from <http://www.utdc.vuw.ac.nz/research/emm/documents/SectorReport.pdf>

Marshall, S., Mitchell, G., & Beams, S. (2007). Benchmarking for quality improvement: the e-learning maturity model. Paper presented at *Ascilite conference: ICT: Providing Choices for Learners and Learning*, Singapore, December, 2-5, 2007. Retrieved from: <http://www.ascilite.org.au/conferences/singapore07/procs/marshall-poster.pdf>

- Martin, B. R. (2011). The Research Excellence Framework and the 'impact agenda': are we creating a Frankenstein monster?. *Research Evaluation*, 20(3), 247-254. Retrieved February 27, 2012, from [www.rev.oxfordjournals.org/content/20/3/247.full.pdf](http://www.rev.oxfordjournals.org/content/20/3/247.full.pdf)
- Martinez, J., Newsome, K. L., & Sheble, M. A. (1998). Planning and budgeting the transition to a digital tomorrow. *The Serials Librarian*, 34(3), 353-360. Retrieved April 11, 2011, from Informaworld database.
- McClure, C., & Lopata, C. L. (1996). Assessing the academic networked environment: strategies and options. Retrieved November 16, 2011, from <http://www.eric.ed.gov/PDFS/ED393456.pdf>
- McKiernan, G., & Ohler, L. A. (2006). The keys to successful change management for serials. *The Serials Librarian*, 51(1), 37-72. Retrieved December 4, 2009, from Informaworld database.
- McKnight, S. (2007). Acquisition and cataloguing processes: changes as a result of customer value discovery research. *Evidence Based Library and Information Practice*, 2(4), 22-35. Retrieved February 8, 2010, from <http://ejournals.library.ualberta.ca/index.php/EBLIP/index>
- McKnight, S. (2010). (Ed.). *Envisioning Future Academic Library Services: initiatives, ideas and challenges*. London: Facet publishing.
- McKnight, S., & Austin, K. (2008). Customer Value Discovery for the not-for-profit sector. Retrieved August 7, 2009, from Nottingham Trent University repository: [http://irep.ntu.ac.uk/R/?func=dbinjumpfull&object\\_id=195606&local\\_base=GEN01](http://irep.ntu.ac.uk/R/?func=dbinjumpfull&object_id=195606&local_base=GEN01)
- McKnight, S., & Berrington, M. (2008). Improving customer satisfaction: changes as a result of customer value discovery. *Evidence Based Library and Information Practice*, 3(1), 33-52. Retrieved August 7, 2009, <http://ejournals.library.ualberta.ca/index.php/EBLIP/issue/view/119>

- McKnight, S., & Livingston, H. (2003). So what do customer value propositions and strategic planning have to do with teaching and learning? Paper presented at *EDUCAUSE in Australasia 03: Expanding the Learning Community, Meeting the Challenges*, Adelaide, Australia, 6-9 May 2003.
- McLoughlin, R. (2010). CIG conference 2010: changes in cataloguing in 'interesting times'. *Ariadne*, (65). Retrieved June 10, 2011, from, <http://www.ariadne.ac.uk/issue65/cig-2010-rpt/>
- Media and Public Relations Department. (2009). *Press report*. Jordan: [JO1 University]
- Microsoft Office. (2010). *Visio 2007*. Retrieved February 2, 2010, from, <http://office.microsoft.com/en-us/visio/default.aspx?ofcresset=1>
- Mikeal A., Creel, J., Maslov, A., Phillips, S., Leggett, J., & McFarland, M. (2009). Large-scale ETD repositories: a case study of a digital library application. Paper presented at *the Joint Conference on Digital Libraries*, Austin, TX, USA, 15-19 June 2009.
- Miles, M. B., & Huberman, A. M. (1994). *Qualitative Data Analysis: An Expanded Sourcebook*, Second edition. Thousand Oaks, CA: Sage.
- Mills, J., Bonner, A., Francis, K. (2006). The development of constructivist grounded theory, *International Journal of Qualitative Research Methods*, 5(1), 1-10.
- Mintzberg, H. (1980). Structure in 5's: a synthesis of the research on organisation design. *Management Science*, 26(3), 322-341. Retrieved June 11, 2011, from EBSCO database.
- Moghaddam, G. G., & Moballeghi, M. (2007). The importance of aggregators for libraries in the digital era. *Interlending and Document Supply*, 35(4), 222-225. Retrieved January 8, 2010, from Emerald database.



- Montgomery, C. H., & King, D. W. (2002). Comparing library and user related costs of print and electronic journal collections: a first step towards a comprehensive analysis. *D-Lib Magazine*, 8(10). Retrieved February 19, 2010, from <http://www.dlib.org/dlib/october02/10contents.html>
- Morgan, G. (1997). *Images of organisation*. Thousand Oaks, CA: Sage.
- Mortimore, J. M. (2005). Access-informed collection development and the academic library: using holdings, circulation, and ILL data to develop prescient collections. *Collection Management*, 30(3), 21-37. Retrieved February 11, 2010, from Informaworld database.
- Moyle, M. (2008). Improving access to European e-theses: the DART-Europe programme. *Library Quarterly*, 12(3/4). Retrieved February 27, 2012, from [http://liber.library.uu.nl/publish/issues/2008-3\\_4/index.html?000268](http://liber.library.uu.nl/publish/issues/2008-3_4/index.html?000268)
- Mugridge, R. L. (2006). Managing Digitization Activities. Retrieved January 25, 2010, from <http://www.arl.org/bm~doc/spec294web.pdf>
- Murtagh, J., & Williams, C. (2003). 'Tell me what you want, what you really, really want!' Developing students' information skills at Manchester Metropolitan University (MMU) Library, by asking the right questions, and giving the right answers. *New Review of Academic Librarianship*, 9(1), 101-112. Retrieved Jun 3, 2008, from Informaworld database.
- The National Student Survey*. (2011). Retrieved June 6, 2011, from [http://www.thestudentsurvey.com/faqs/faqs\\_1.html](http://www.thestudentsurvey.com/faqs/faqs_1.html)
- Neal, C., Parsonage, H., & Shaw, H. (2009). It is all up for grabs: developing a new role for the academic liaison team at NTU. *SCONUL Focus*, 45, 4-8. Retrieved May 9, 2011, from <http://www.sconul.ac.uk/publications/newsletter/45/>
- Nelsen, J., & Scoble, M. (2006). Social license to operate mines: issues of situational analysis and process. Retrieved February 27, 2012, from [www.mining.ubc.ca/files/SocialLicense/Final%20MPES%20Paper.pdf](http://www.mining.ubc.ca/files/SocialLicense/Final%20MPES%20Paper.pdf)

- Neyland, D. (2006). Dismissed content and discontent: an analysis of the strategic aspects of Actor-Network *Theory*. *Science, Technology & Human Values*, 31(1), 29-51. Retrieved June 11, 2011, from JSTOR database.
- Ngulube, P. (2004). A double-edged sword: challenges and opportunities offered by the digital age to the African information society. Paper presented at *the 3rd Biennial DISSAnet Conference, ProLISSA*, Pretoria, South Africa, 28-29 October 2004
- Noran, O. S. (2000). Business modeling: UML vs. IDEF. Retrieved December 24, 2009, from <http://hobbit.ict.griffith.edu.au/~noran/Docs/UMLvsIDEF.pdf>
- Norton, D., & SEM Product Management. (1999). *SAP strategic Enterprise Management, Translating strategy into action: the balanced scorecard*. [Brochure]. SAP AG
- Nurminen, M. I., & Torvinen, V. (1996). *Role-based Interpretations of ISs, TUCS Technical Report No. TUCS-TR-9*, Turku: Turku Centre for Computer Science.
- Odeh, M., Beeson, I., Green, S., & Sa, J. (2003). Modeling Processes Using RAD and UML Activity Diagrams: an Exploratory Study. Paper presented at *the 3rd International Arab Conference on Information Technology, ACIT2002*, Doha, Qatar, 16-19 December 2003.
- Olorunsola, R. (2000). Libraries as bureaucracies: the viewpoints of librarians. *Library Management*, 21(1), 42-48. Retrieved June 11, 2011, from Emerald database.
- Online Writing Lab. (2012). *APA formatting and style guide*. Indiana: Purdue University. Retrieved from <http://owl.english.purdue.edu/owl/resource/560/09/>
- Opdahl, A. L., & Sindre, G. (1995). Representing Real World Processes. Paper presented at *the 28<sup>th</sup> Hawaii International Conference on System*

Sciences, HICSS'95, Hawaii, US. Retrieved May 22, 2009 from IEEE Computer Society.

Orlikowski, W. J., & Baroudi, J. J. (1999). Studying Information Technology in Organisations: Research Approaches and Assumptions. *Information Systems Research*, 2(1), 1-28. Retrieved September 19, 2010, from EBSCO.

Ould, M. (1995). *Business Processes: Modeling and analysis for re-engineering and improvement*. Chichester, West Sussex: Wiley.

Ould, M. (2005). *Business Process Management: A rigorous approach*. Swindon: The British Computer Society.

Owusu-Ansah, E. K. (2001). The academic library in the enterprise of colleges and universities: toward a new paradigm. *Journal of Academic Librarianship*, 27(4), 282-294. Retrieved December 4, 2009, from ScienceDirect database.

Palmer, J. (2009). Review of scholarly communications presentations in UK higher education library portals. Retrieved February 28, 2012, from [www.ie-repository.jisc.ac.uk/541/2/d2d\\_appendix1.doc](http://www.ie-repository.jisc.ac.uk/541/2/d2d_appendix1.doc)

Palmer, J. (2010). Brief Copac overview. Retrieved February 27, 2012, from [www.rin.ac.uk/system/files/.../RIN\\_OCLC\\_Brief\\_Copac\\_Overview.pdf](http://www.rin.ac.uk/system/files/.../RIN_OCLC_Brief_Copac_Overview.pdf)

Pan, D., Somerville, M. M., Howard, Z., & Mirijamdotter, A. (2009). From evidence to action: A shared leadership approach. Paper presented at *the EBLIP5: Bridging the Gap*, Stockholm, Sweden, UK, June 29-July 3. Retrieved February 19, 2010, from <http://blogs.kib.ki.se/eblip5/parallel-sessions.html>

Parsons, A. (2010). Academic liaison librarianship: curatorial pedagogy or pedagogical curation. *Ariadne*, (65). Retrieved June 2, 2011, from <http://www.ariadne.ac.uk/issue65/parsons/>

- Parvatiyari, A., & Sheth, J. N. (2001). Customer relationship management: emerging practice, process, and discipline. *Journal of Economic and Social Research*, 3(2), 1-34. Retrieved May 22, 2011, from EBSCO.
- Patterson, J. M. (2011). The benefits of microfiche and microfilm scanning for businesses. Retrieved April 11, 2011, from <http://ezinearticles.com>
- Payne, P. (1996). User empowerment: striking back for the customers of academic libraries. In C. Pinder & M. Melling (Eds.), *Providing customer-oriented services in academic libraries* (pp. 59-86). London: Library Association Publishing.
- Payne, P., & Conyers, A. (2005). Measuring the impact of higher education libraries: the LIRG/SCONUL impact implementation initiative. *Library and Information Research*, 29(91). Retrieved August 22, 2010, from <http://eprints.bbk.ac.uk/148/1/Payne1.pdf>
- Pickering, H., & McMenemy, D. (1999). Widening the SCOPE: Higher Education ON-demand (HERON). *Program*, 33(3), 213-224
- Pinfield, S. (2001). The changing role of subject librarians in academic libraries. *Journal of Librarianship and Information Science*, 33(1), 32-38. Retrieved December 28, 2009, from <http://eprints.nottingham.ac.uk/33/3/jolis.pdf>
- Pisanski, J., & Žumer, M. (2010). Intuitiveness of Functional Requirements for Bibliographic Records: a study in a broader context. *Information research*, 15(4). Retrieved June 10, 2011, from <http://informationr.net/ir/15-4/colis725.html>
- Plate, K. H., & Stone, E. W. (1974). Factors affecting librarian's job satisfaction: a report of two studies. *The Library Quarterly*, 44(2), 97-110. Retrieved February 10, 2011, from JSTOR
- Plesums, C. A. (2007). Introduction to microfilm as used for office documents. Retrieved April 22, 2011, from <http://www.plesums.com/image/filmintro.html>

- Prasad, B. (1999). Hybrid re-engineering strategies for process improvement. *Business Process Management Journal*, 5(2), 178-197.
- Presley, A. R., & Liles, D. H. (2001). A holon-based process modelling methodology. *International Journal of Operations & Production Management*, 21(5-6), 565-581. Retrieved December 7, 2009, from Emerald database.
- Purcell, A. D. (2009). Making the most of your historical assets. *Information Management*, Jan/Feb, 46-48. Retrieved April 12, 2011, from [http://content.arma.org/imm/JanFeb09/making\\_the\\_most\\_of\\_your\\_historical\\_assets.aspx](http://content.arma.org/imm/JanFeb09/making_the_most_of_your_historical_assets.aspx)
- Ramakrishnan, R., & Gehrke, J. (2000). *Database Management Systems* (3<sup>rd</sup> ed.). Columbus, OH: McGraw Hill.
- Ranganathan, S. (1963). *The Five Laws of Library Science*. Bombay: Asia publishing house.
- Rathe, B. (2005). Recreational reading collections in academic libraries. *Collection Management*, 30(2), 73-85. Retrieved February 8, 2010, from Informaworld database
- Rau, E. P. (2007). Managing the machine in the stacks: operations research, bibliographic control and library computerization, 1950–2000. *Library History*, 23(2), 151-168.
- Reid, B. (2000). Organisational models for managing academic information. In B. J. Reid & W. Foster (Eds.), *Achieving cultural change in networked libraries* (pp. 15-26). London: Gower.
- Richardson, H., & Robinson, B. (2007). The mysterious case of the missing paradigm: a review of critical information systems research 1991–2001. *Information Systems Journal*, 17(3), 251-270
- Riessman, C. K. (2003). Narrative Analysis. In M. S. Lewis-Beck, A. Bryman & T. F. Liao (Eds.), *The Sage Encyclopedia of Social Science Research*

*Methods* (volume 3). Thousand Oaks, CA: Sage. Retrieved October 20, 2011, from [http://www2.hud.ac.uk/hhs/nme/books/2005/Chapter\\_1\\_-\\_Catherine\\_Kohler\\_Riessman.pdf](http://www2.hud.ac.uk/hhs/nme/books/2005/Chapter_1_-_Catherine_Kohler_Riessman.pdf)

Rojas, F., & Martínez, A. I. (1998). From process modelling to enactment and simulation. Proceedings of *the 12<sup>th</sup> European Simulation Multi-conference on Simulation - Past, Present and Future*, Manchester, UK, June 16-19 1998.

Rosemann, M. (2006). Potential pitfalls of process modeling: part A. *Business Process Management*, 12(2), 249-254.

Russell, J. (2009). EThOS: from project to service. *Ariadne*, (59). Retrieved April 24, 2011, from <http://www.ariadne.ac.uk/issue59/russell/>

Russell Group. (2010). Our universities. Retrieved October 13, 2010, from <http://www.russellgroup.ac.uk/our-universities/>

Sarbin, T. R. (1954). Role Enactment. In B. J. Biddle & E. J. Thomas (Eds.), *Role Theory: Concepts and Research* (pp. 195-200). New York: Wiley.

Schroeder, R. (2012). When patrons call the shots: patron-driven acquisition at Brigham Young University. *Collection Building*, 31(1), 11-14. Retrieved February 28, 2012, from Emerald database.

Schwartzkopf, B. (2007). Old is new again: using established workflows to handle electronic resources. *Serials Librarian*, 52(3-4), 277-280.

Scigliano, M. (2000). Serial Use in a Small Academic Library: Determining Cost-Effectiveness. *Serials Review*, 26(1), 43-52. Retrieved February 19, 2010, from ScienceDirect database.

SCONUL. (2007). *SCONUL topics and issues*. Retrieved March 30, 2010, from [http://www.sconul.ac.uk/topics\\_issues/](http://www.sconul.ac.uk/topics_issues/)

SCONUL. (2005). *E-learning taskforce: final report*. Retrieved August 24, 2010, from <http://www.sconul.ac.uk/groups/e-learning/papers/finalreport.pdf>

- SCONUL Advisory Committee on Information Literacy. (1999). *Information skills in higher education*. Retrieved August 30, 2010, from [http://www.sconul.ac.uk/groups/information\\_literacy/papers/Seven\\_pillars2.pdf](http://www.sconul.ac.uk/groups/information_literacy/papers/Seven_pillars2.pdf)
- Sennyey, P., Ross, L., & Mills, C. (2009). Exploring the future of academic libraries, a definitional approach. *Journal of Academic Librarianship*, 35(3), 252-259.
- Shneiderman, B., & Plaisant, K. (1994). The Future of Graphic User Interfaces: Personal Role Managers. Paper presented at *the conference on People and Computers IX*, Glasgow, UK, August 24-26, 1994.
- Siddiqui, M. A. (2003). Management for change in acquisitions in academic libraries. *The electronic Library*, 21(4), 352-357. Retrieved February 11, 2010, from Emerald database.
- Simon, S. D. (n.d.). The principles of Constructivism. Retrieved September 6, 2010, from <http://web.rollins.edu/~gvaliante/ClassMaterials/Constructivism.pdf>
- Sommerville, I. (2001). *Software Engineering*. Redwood city, CA: Addison Wesley
- Spanhoff, E. R. (2002). Principles issues: cataloguing paradigms, old and new. *Cataloguing and Classification Quarterly*, 35(1), 37-59. Retrieved June 7, 2010, from Informaworld database.
- Stanford University (2005). *Process changes discussion*, In Stanford University Libraries Redesign Report, Retrieved January 21, 2009, from <http://library.stanford.edu/depts/ts/about/redesign/report/sect8.html>
- Steele, G. (2011). The wisdom of the cataloguers: LCSH, indexer inconsistencies and collective intelligence. Paper presented at *the CIG conference*, Exeter, September 13-15, 2010. Retrieved June 10, 2011, from <http://www.iskouk.org/conf2011/abstracts.htm>

- Stevenson, R. (1993). Strategic business process engineering: a systems thinking approach using itthink. In K. Spurr, P. Layzell, L. Jennison & N. Richards (Eds.), *Software Assistance for Business Re-engineering* (pp. 99-118). New York: Wiley.
- Streatfield, D. & Markless, S. (2008). Evaluating the impact of information literacy in higher education: progress and prospects. *Libri*, 58, 102-109. Retrieved December 7, 2009, from <http://www.librijournal.org/pdf/2008-2pp102-109.pdf>
- Sutherland, J. (2008). A mass digitization primer. *Library Trends*, 57(1), 17-23. Retrieved April 11, 2011, from Project MUSE database
- Sutton, A. (2010). *CentAUR, JISC repository start-up project: final report*. Retrieved April, 27, 2011, from <http://www.jisc.ac.uk/whatwedo/programmes/inf11/sue2/centaur>
- Sutton, B. (1993). The rational for qualitative research: A review of principles and theoretical foundations. *The Library Quarterly*, 63(4), 411-430. Retrieved January 23, 2009, from JSTOR database.
- Tedd, L. A. (2007). Library management systems in the UK: 1960s-1980s. *Library History*, 23(4), 301-316. Retrieved December 7, 2009, from Aberystwyth University repository <http://cadair.aber.ac.uk/dspace/bitstream/2160/566/3/s5.pdf>
- Thomas, E. J. (1959). Role Conceptions, Organisational Size and community Context. In B. J. Biddle & E. J. Thomas (Eds.), *Role Theory: Concepts and Research* (pp. 164-171). New York: Wiley.
- Tinnilä, M. (1995). Strategic perspective to business process redesign. *Business Process re-engineering and Management Journal*, 1(1), 44-59.
- Town, S. (2004). E-measures: comprehensive waste of time. *VINE: The Journal of Information and Knowledge Management Systems*, 34(4), 190-195. Retrieved December 7, 2009, from Emerald database.



- Town, S. (2011). Value, Impact, and the transcendent library: progress and pressures in performance measurement. *The Library Quarterly*, 81(1), 111-125. Retrieved June 6, 2011, from JSTOR database.
- [UK1] Information Services. (2007). IS News. Retrieved April 26, 2009, from [UK1] university website.
- Urquhart, C. (2002). Applications of outsourcing theory to collaborative purchasing and licensing. *Vine*, 32(4), 63-70. Retrieved June 11, 2011, from Emerald database.
- Urquhart, C., & Bonarou, A. (2011). Using actor network theory to understand change in academic libraries. Paper presented at *Qualitative and Quantative Methods in Libraries: (QQML 2011) conference*, Athens, Greece, May 24-27 2011.
- Urquhart, C., Lonsdale, R., Thomas, R., Spink, S., Yeoman, A., Armstrong, C., & Fenton, R. (2004). *JUSTEIS: JISC Usage Surveys: Trends in Electronic Information Services: final report*. Aberystwyth: Department of Information Studies, University of Wales Aberystwyth. Retrieved October 13, 2010, from <http://cadair.aber.ac.uk/dspace/bitstream/2160/239/1/JUSTEIS%20cycle%205%20report.pdf>
- Veaner, B. A. (1990). *Academic librarianship in a transformational age: program, politics and personnel*. Boston, MA: G.K. Hall & Co.
- Vinkler, P. (2010). *The evaluation of research by scientometric indicators*. Oxford: Chandos
- Wahlke, J. C., Eulau, H., Buchanan, W., & Ferguson, L. C. (1962). The Roles of Legislators in the Legislative Process. In B. J. Biddle & E. J. Thomas (Eds.), *Role Theory: Concepts and Research* (pp. 243-254). New York: Wiley.

- Wakeham, M. (2004). Marketing and health libraries. *Health Information and Libraries Journal*, 21(4), 237-244. Retrieved May 22, 2011, from Wiley online library.
- Walshe, C. E., Caress, A. L., Chew-Graham, C., & Todd, C. J. (2004). Case Studies: A research strategy appropriate for palliative care?. *Palliative Medicine*, 18, 677-684. Retrieved December 11, 2009, from <http://cuidadospaliativos.org/archives/Case%20studies.pdf>
- Walton, G. (2006). Learners' demands and expectations for space in a university library: outcomes from a survey at Loughborough University. *New Review of Academic Librarianship*, 12(2), 133-149. Retrieved June 3, 2008, from Informaworld database.
- Waring, T., & Wainwright, D. (2002). Communicating the complexity of computer-integrated operations: an innovative use of process modelling in a north east hospital trust. *International Journal of Operations and Production Management*, 22(4), 394-411.
- Warwick University. (2011). Warwick Research Archival Portal. Retrieved April 27, 2011, from <http://www2.warwick.ac.uk/services/library/main/research/instrep/erepositories>
- Wasserman, S. & Polk, E. (2006). Introduction to cataloguing and classification for the SSC librarian. Proceedings of *the 41<sup>st</sup> Annual Convention of the Association of Jewish Libraries*, Cambridge, June 18-21 2006. Retrieved June 22, 2010, from [http://www.jewishlibraries.org/ajlweb/publications/proceedings/proceedings2006/wasserman\\_cataloging.pdf](http://www.jewishlibraries.org/ajlweb/publications/proceedings/proceedings2006/wasserman_cataloging.pdf)
- Weber, R. (2004). The rhetoric of positivism versus interpretivism. *MIS Quarterly*, 28(1), iii-xii
- Wieggers, K. (1988). Software engineering: programme design considerations. *ST-Log* (25), 18-33. Retrieved December 28, 2010, from <http://www.atarimagazines.com/st-log/index/>

- Wilder, S. (2000). The changing profile of research library professional staff. *ARL: a bimonthly report on research library issues and actions from ARL, CNI and SPARC*, 208-209. Retrieved December 28, 2009, from <http://www.arl.org/bm~doc/chgprofile.pdf>
- Wilson, K. M. & Halpin, E. (2006). Convergence and professional identity in the academic library. *Journal of Librarianship and Information Science*, 38(2), 79-91.
- Xia, J. (2007). Assessment of self-archiving in institutional repositories: across disciplines. *Journal of Academic Librarianship*, 33(6), 647-654. Retrieved May 23, 2011, from ScienceDirect database.
- Yin, R. K. (2003), *Case Study Research: design and Methods*. Thousand Oaks, CA: Sage.
- Younis, A. R. (2005). Local online information systems in Jordanian university libraries. *Online Information Review*, 29(1), 54–74. Retrieved October 10, 2011, from Emerald database
- Zairi, M., & Sinclair, D. (1995). Business process re-engineering and process management: a survey of current practice and future trends in integrated management. *Business Process Re-engineering and Management Journal*, 1(1), 8-30.
- Zhu, H., & Zhou, M. C. (2006). Role-based collaboration and its kernel mechanisms. *Transactions on Systems, Man and Cybernetics – part C: Application and Reviews*, 36(4), 578-589. Retrieved October 12, 2011, from IEEE Xplore
- Zhu, H., & Zhou, M. C. (2008). Roles in information systems: a survey. *Transactions on Systems, Man and Cybernetics – part C: Application and Reviews*, 38(3), 377-396. Retrieved 12 October, 2011, from IEEE Xplore

## Appendices

## ***Appendix 1: Information letter distributed to library staff interviewed, to explain the research topic***

### **Invitation to take part in an interview**

My name is Dina Tbaishat. I am a PhD student from Information Studies Department at Aberystwyth University.

Please take few minutes to read the following information carefully. If you would like more information about this research project and what it involves, please contact me using the contact details provided at the end of this letter.

My research is about visualizing and improving business processes in academic libraries. I'm considering two contrasting sites for my research: Aberystwyth University library and the library at University of Jordan. I'm at the stage of collecting data at the moment and I'm using qualitative research methods such as interviews.

As I come from computing background (not librarianship); I'm not familiar with the details of business processes in academic libraries. I do need to understand the actual work in the library and the existing different processes within this organisation to be able to visualize them in a modeling technique called RAD (Role Activity Diagram).

To achieve that, I need the staff's cooperation in the library, that's why I'm inviting you for an interview to understand the work being done in the library in attempt for improvements.

All interviews follow the 'question/answer' theme, with the ability of expansion if needed. Here are some elements regarding the interviews:

**Duration:** The interview shouldn't take long, estimation of 30-45 minutes.

**Schedule:** Arranging an interview will be via email between the researcher and the interviewee.

**Recording:** As English is my second language, I would much prefer to record the interview. Note that all interviews will be anonymous. This tape recording will be used only for this piece of research, and will be used in accordance with UK data

protection legislation and the ethical research procedures of the Aberystwyth University.

**Confidentiality:** All information will be treated confidentially.

**Anonymity:** All interviews will be anonymous and personal data removed at the transcription stage. No individuals will be identified in the results.

**Data security:** The information gathered will be kept securely and only for analysis and modeling purposes.

I look forward to hearing from you.

Dina Tbaishat

E-mail: [dmt07@aber.ac.uk](mailto:dmt07@aber.ac.uk)

Address: Flat 2  
3 Bridge Street  
Aberystwyth  
SY23 1PY

## ***Appendix 2: Consent form distributed to library staff interviewed***

### **Consent form**

**Title of project:** PhD Thesis; visualizing and improving business processes in academic libraries.

**Department:** Information Studies at Aberystwyth University.

**Name of researcher:** Dina Tbaishat

**Project authority:** This research project is being undertaken as requirement for completing a PhD degree in Information Studies department at Aberystwyth University.

- |  | <b>Please tick</b>       |
|--|--------------------------|
| 1. I have read and understood the information letter for participants.   | <input type="checkbox"/> |
| 2. I agree that the data I provide may be used by the researcher within the conditions outlined in the Information Letter.                                   | <input type="checkbox"/> |
| 3. I agree to the use of any anonymised direct quotes in the report.   | <input type="checkbox"/> |
| 4. I understand that my decision to consent is entirely voluntary and that I am free to withdraw from the study at any time without having to give a reason. | <input type="checkbox"/> |
| 5. I consent to participate in this study about business process modeling in academic libraries.   | <input type="checkbox"/> |

<b>Name of participant (IN BLOCK LETTERS)</b>	<b>Signature</b>	<b>Date</b>
<b>Name of researcher (IN BLOCK LETTERS)</b>	<b>Signature</b>	<b>Date</b>

**Please return this Consent Form to:**

Dina Tbaishat

E-mail: [dmt07@aber.ac.uk](mailto:dmt07@aber.ac.uk)

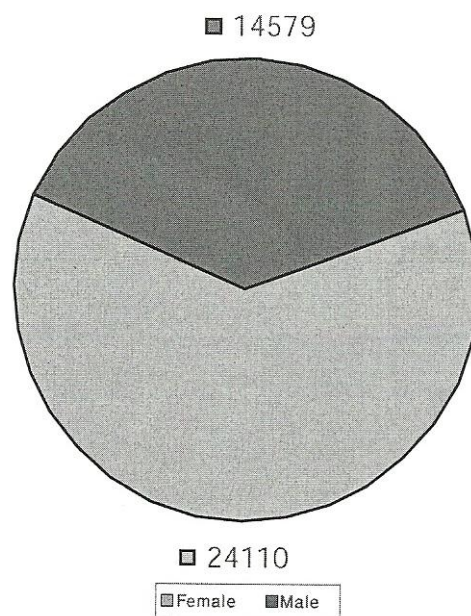
Address: Flat 2, 3 Bridge Street  
Aberystwyth, SY23 1PY

### ***Appendix 3: Documentary information and archival records from case study sites***

**Grand Total of the Student Body According to Gender for the Academic Year 2007/2008**

Gender	Figures	Ratio
Female	24110	62.32
Male	14579	37.68
Total	38689	100%

**Grand Total of the Student Body According to Gender for the Academic Year 2007/2008**



Statistical report for student numbers in JO1

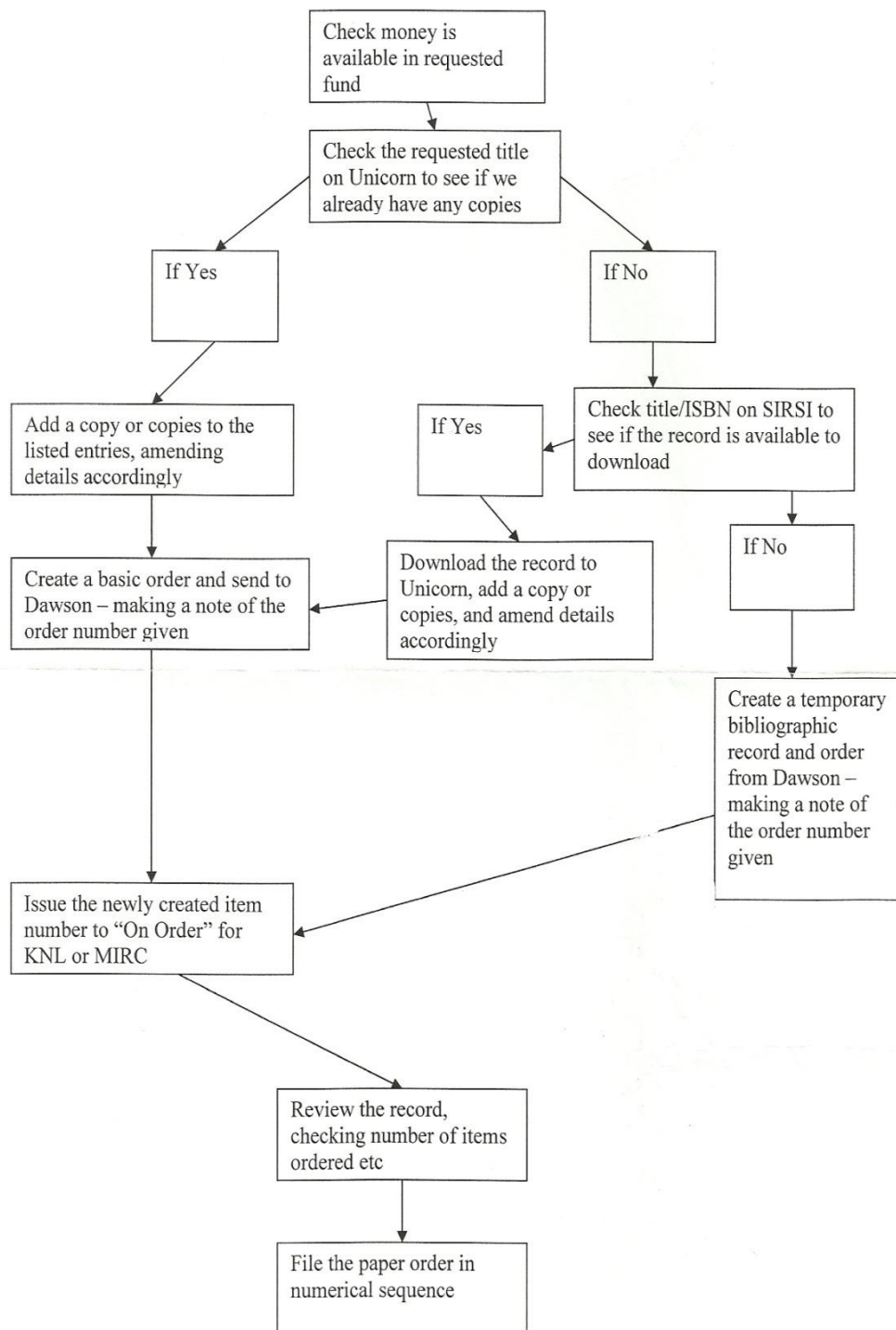


### The University Main Library Acquisitions

Acquisition Type	Figures
Arabic Books	291672
English Books	212671
Graduate Thesis/Dissertations	49895
Digital Collections	2569
Special Collections	14992
Arabic and English References	51347
Electronic Books	43000
Arabic and English Periodical Volumes	170847
Audio-Visual Material and Microfilms/Microfiches	32733
Arabic and English Electronic Periodicals	39088
<b>Total of Main Library Acquisitions</b>	<b>908814</b>
<b>Total of Faculty Reading Halls Acquisitions</b>	<b>55076</b>
<b>Gross Total of Library Acquisitions</b>	<b>963890</b>

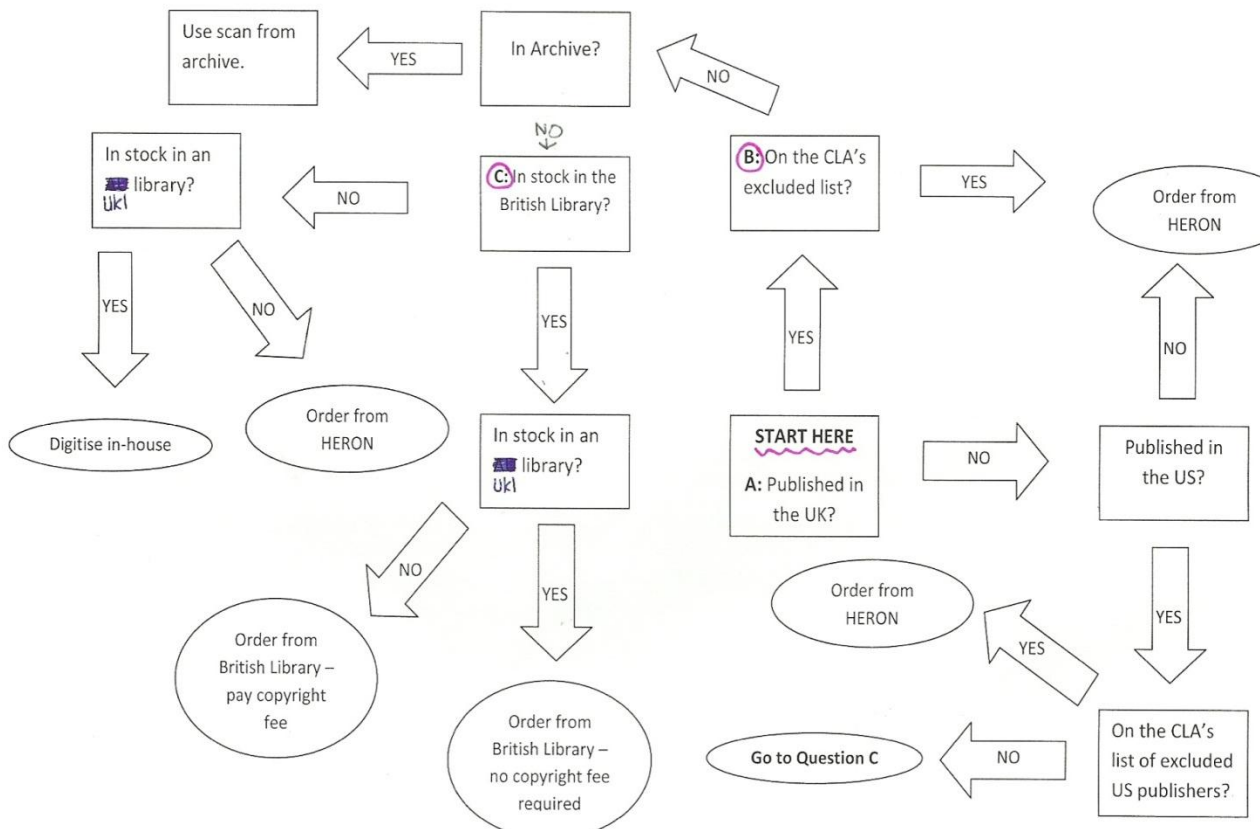
Statistical report for library items in JO1 (2007-2008)

### Process for ordering books from Dawson

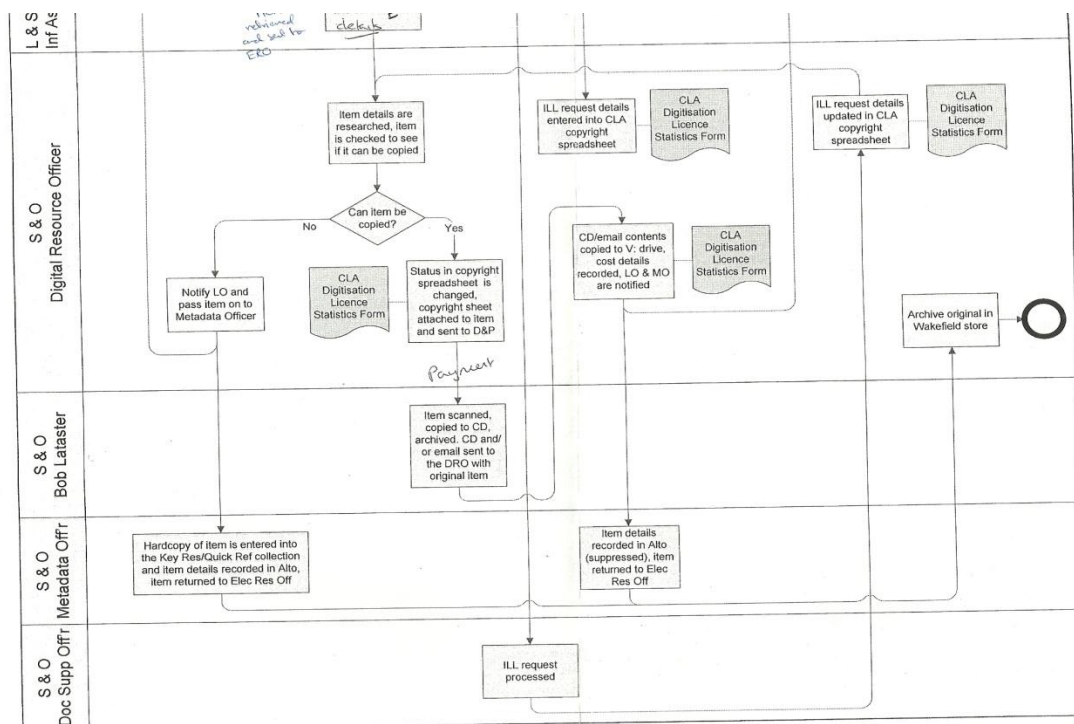
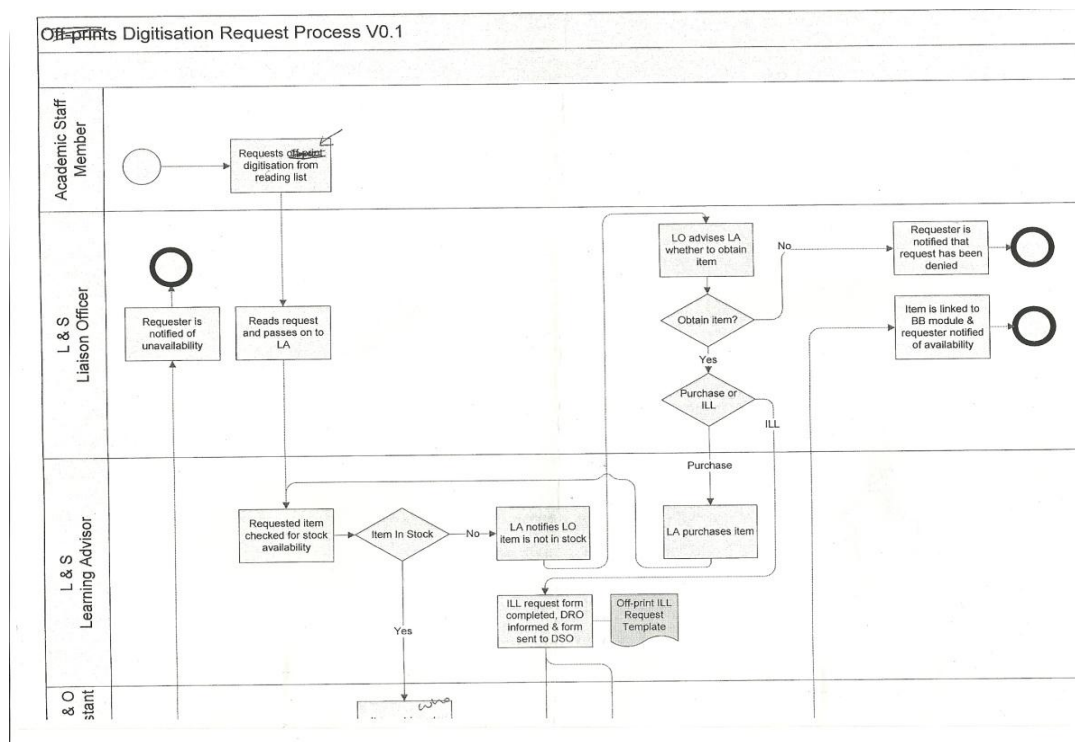


Flow chart representing book ordering in UK2

# **ORDERING PROCESS** **DIGITISATION FLOW CHART**



Flow chart from lending services team member in UK1, to represent digitization-the ordering process.



Flow chart from the Support Services Manager in UK1. This represents the digitization request process in the previous university library she used to work for. The flow chart comes in two separate papers.

## Appendix 4: Interview guides

Note that in this table, there are common questions for all staff (written in blue) while there are different questions customized according to the process in which the interviewee is involved (in black). Some of those in black however, could be common between some processes, that is why some processes' cells were merged to include common questions.

Interview guides for managers & library staff for all selected processes					
Acquisitions	Cat. & Class.	Managerial level	Binding	Digitization	Theses handling
If you can start by giving me a brief introduction about who you are, and what your main role is in the library.					
		What are the main processes taking place at this library?  Are the processes similar in all University libraries (campuses)?  Is the budget centralized?			
To which team do you belong?  How many are you in the team?  How long have you been working here?			To which team do you belong?  How many are you in the team?  How long have you been working here?		
Does your work include any kind of processes?					
I am interested in the order of activities when modelling, so could you give me more information about the detailed activities in this process?			I am interested in the order of activities when modelling, so could you give me more information about the detailed activities in this process?		
Does the process always start with the academics or it could	Do you have systemized way of work?	Do you encourage going for e-resources rather than print?	Could you please explain a bit more about the bid?	When did you start digitizing material?	Is it mandatory for students to submit their theses to the library?

<p>be by the library itself?</p> <p>Is there a certain time for the ordering?</p> <p>Does everything fall under the same budget?</p> <p>Based on what do you choose the supplier?</p> <p>Do you negotiate with them?</p> <p>Once you reach an agreement with a provider, what is next?</p> <p>So what is the method of ordering online?</p> <p>Who deals with the payments for items ordered as print?</p> <p>Do you agree with the provider on a deadline for receiving the books?</p> <p>Could you please tell me the differences</p>	<p>Can you give me an approximate number of books you classify?</p> <p>Do you have a collection of books not yet catalogued? If yes then are they extra copies?</p> <p>Is the process centralized?</p> <p>Do you need to communicate with other branches?</p> <p>What is the branches' job?</p> <p>What does the subject librarian exactly do?</p> <p>What is your coding system by the way?</p>	<p>Where are you in terms of digitization?</p> <p>Who do you recommend I speak to?</p>	<p>What happens when the contractor does not bring the books back on time?</p> <p>Do you renew contracts with them if you think they were good?</p> <p>What happens when a book is lost?</p>	<p>How do you decide on which material to digitize?</p> <p>So what is the process like? Is there a form to fill at the beginning?</p> <p>Do you have a lot of resources for digitization?</p> <p>Do you have separate budget for digitization?</p> <p>Do you digitize everything?</p> <p>Digitization is different than electronic material, why do you need to digitize them if you can buy them electronically?</p> <p>So the license gives you the right to digitize any sort of material form Britain and the US?</p>	<p>How do you receive the theses and how often?</p> <p>Where does the thesis go after that?</p> <p>Can students access theses electronically?</p>
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<p>between ordering print journals and electronic ones?</p> <p>I learnt that you are a member of a consortium; could you explain more how this affects your orders?</p>				<p>Does the subject support librarian make sure what is requested is there or not? Or is it your job?</p> <p>Marketing is a big important issue here to promote the service, where are you in terms of marketing?</p>	
What are the main challenges facing the library these days?					
Is there anything you like to see improved in the library?					
Do you have any documents regarding the process that I can get hold of?					
Is there anything else you would like to add?					

## ***Appendix 5: Coding and memos example for one transcript from JO2 case study***

### **The notes in red are memos, while the blue ones are codes**

**Dina:** If you can start by giving me a brief introduction about who you are, and what your main role is in the library?

My name is ... I'm the **head of database department** which is basically responsible for all electronic resources acquisitions and maintenance. We deal with the subscriptions with EBSCO which is our main provider, and we deal with all electronic resources. I supervisor the work and I'm responsible of training and development. [a name] is responsible of verification and checking, sometimes data entry for books; she's also responsible for the CDs library. [a name] is an assistant, basically providing services and assistance to users (both staff and students), also any maintenance issues, he can give you an introduction about the system.

**Dina:** I am interested in the order of activities when modelling, so could you give me more information about the detailed activities in this process? who initiates the process of subscription?

For databases it starts with a request from the academic staff, that they wish to subscribe to a specific database, we ask for a trial for that database, we evaluate it and decide based on the evaluation. After evaluation is done, we then move to deciding how much it'll cost and what discounts we can get, usually the price depends on the number of users (number of universities subscribing to it), when all this information is ready and after getting approval from the president; we subscribe to the database. **Flow of activities → helps in RAD**

**Dina:** How does that go exactly?

We send an email to the responsible person, we inform them that we need to subscribe to that database starting from a specific date, the subscription is activated and an invoice is sent to the library, it's forwarded to the finance office and to the president, in case the amount of **money is high. (when authorisation is needed)**



**Dina:** Does the process always start with academics requesting a journal?

No, it can **start with publisher** come in to present an offer, we would ask for trial, if we think it's useful we ask for approval from the president providing a report that it's been evaluated based on the trial and we think it's good for our users.

**Dina:** Is there a certain time for the ordering?

There is no **specific time** or season, it depends when academics need materials.

**Dina:** I learnt that you are a member of the consortium of private universities in Jordan; could you explain more how this affects your orders?

Yes we have membership in the consortium, all private universities have membership in the consortium and they are more than 10 universities, there is **no financial support from the government** though (unlike the consortium of public universities which receives some financial support from the government), so, if other member of our consortium decide to subscribe to a database; then we get a better deal, as the number of users is quite high, but sometimes we need one that the rest of the members of the consortium don't, in that case we can subscribe alone to that database but obviously it'd cost us more, and we've done that before, because we're the only private university that offers Master's in ... for example, so we **subscribed to a related databases alone**. Also, some universities don't have many departments (for example; [a name] University is specialized in ..., so obviously they won't be interested in many other areas that we're interested in. **could help in listing their challenges**.

**Dina:** Finally, what do you think are the major challenges you're facing nowadays?

Well not in my own area, with no exaggeration, we are the best of the private universities in Jordan when it comes to databases and electronic resources acquisitions. We have also become the approved database training centre for other universities; we hold training sessions for databases. In addition; there is an annual report for each database, for EBSCO; we came third in terms of usage (Shoman took number one). For Ebrary however; we're now the first in

electronic books usage. High level of confidence in their work and quality of services

**Dina:** Do you have any documents regarding the process that I can get hold of?

No, you can check with [a name].

**Dina:** Is there anything else you would like to add?

No I think that's it.

**Appendix 6: Paper presented at UKAIS - In UK Academy for Information Systems Conference Proceedings 2009**

**BUSINESS PROCESS MANAGEMENT IN ACADEMIC INFORMATION SERVICES**

Dina Tbaishat, Christine Urquhart and Hugh Preston  
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**Keywords:** Process Modelling, Academic Libraries, Role Activity

**Abstract**

*This paper investigates literature regarding the development of process models within the context of academic libraries. This is an on-going doctoral study and provides an indication of research-in-progress towards design of business models within the library environment. Brief historical analysis of operations research in this context and the development of outcomes-based activity evaluation is offered. The limited literature regarding the emergence of a more systematic view of academic library operations and of other university functions is compared to sources on process modelling in the industrial sector and the potential application of Role Activity Diagrams (RAD). The selection of these tools is explained from amongst the wide range of alternatives available in other sectors.*

**1 Introduction**

One of the founding fathers of library science, S. R. Ranganathan, proposed five laws of library science that may still be applied in essence to library operations today (Ranganathan, 1931). The fifth law, that the library is “a growing organism” emphasises the need to plan and design for the future. Academic libraries serve many different groups of users, and may be considered as systems of integrated activities and business processes that collaborate together to achieve organisational goals (Daneshgar and Parirokh, 2007).

In particular, academic libraries along with their academic institutions play a major role in directing the cultural, political, social, scientific and technological development of a nation (Chaturvedi, 1994). In the UK, the Follett report stressed the need for changed attitudes, changes in the ways of working among library and computing services in universities (Corrall, 1995). In a discussion of what academic libraries do – and should do, Akeroyd (2001) considers the library as a collection of resources as an organisational for information and services to provide it. Within each sphere of activity, there are functions, such as the eight principal functions necessary

for effective collection management suggested by Cogswell (1987). Much of the literature on academic library development during 1999-2006 stresses the need for academic libraries to re-orient themselves in terms of outcomes and to persuade the existing staff in merged existing library and computing services that change was necessary and inevitable. Academic libraries have been encouraged to complete the migration from print to electronic collections, to reposition and to focus on curation rather than collection (Lewis, 2007). The role of “the librarian” has changed, professional role boundaries are less clear (Wilson and Halpin, 2006) and organisational models and culture of working have changed (Reid and Foster, 2000).

Very little of the recent research on academic library operations examines how and why certain processes and functions are conducted, or systematic models as to how the academic library and information service links to essential processes and roles. This paper is based on the literature review for doctoral research on the contribution of business process modelling to a better understanding of academic library operations. The objectives of the paper are to examine the history of operations and business process analysis in academic libraries and to discuss lessons learned.

## **2 Methods**

The literature search strategy was iterative, and complicated by the changes in terminology and fashions in research. A search on LISA (Library and Information Science Abstracts) identified literature from 1979 onwards with articles that examined the evaluation or analysis or modelling that might be used to examine functions, processes or services in academic libraries. ABI/Inform was another database used to identify articles from the business and management perspective. References within articles were followed up to help identify reports, relevant policy documents, and books. To identify further research on business process modelling techniques, Index to Theses was searched.

### **3 Findings**

For this paper, the literature retrieved was sorted into categories to help answer, for example, questions on the history of business process research in academic libraries – what type of questions were popular at particular times? The literature could be divided in categories for early operations research, growth of interest in outcomes-based evaluation, and (since about 2005) the perceived need for more systematic approaches to examining library functions. The remaining category was application of business process modelling techniques, and similar methods that query organisational activities in academic environments.

#### **3.1 Early operations research**

In a history of operations research in academic libraries (Rau, 2007), an argument is made that the skills and knowledge developed by operations research practitioners in wartime were attractive to the research libraries that were beginning to drown in data with the expansion of scientific research after 1945. Control and management of the information was a concern of the scientists as well as the library managers and more scientific approaches to library operations developed. Rau (2007) discusses three 1960s – 1970s examples that included use of Poisson modelling, queuing theory, Monte Carlo and other simulation techniques. In the UK, Donald Urquhart, the creator of the National Lending Library for Science and Technology (now the British Library Document Supply Centre), used probability techniques to help manage the collections that served research libraries in industry and the universities (Bensman, 2005). Interest in such techniques was strong in the 1970s and early 1980s (Rowley and Rowley, 1981) but little has been published since (but see Shim, 2003). There has been a shift of emphasis towards bibliometric studies, among the researchers. Rau (2007) suggests that operations research provided a basis for the large scale library computerisation projects of the 1980s and 1990s. However, most of the emphasis in the development of library management systems was on how the technology would work, developing the information processing, machine readable cataloguing and co-operative approaches to cataloguing and automation. With the development of turnkey systems in the 1980s, little expertise was required by library staff (Tedd, 2007).

### **3.2 Outcomes-based evaluation of activity in academic libraries**

In the late 1970s other approaches to examining the activities of a library were developing. The book by Lancaster and Cleverdon (1977), based on a conference in 1975, presaged the growing emphasis on outcomes of library use and a greater interest in what the users did with the information obtained. The Joint Information Systems Committee of the Funding Councils funded many electronic library initiatives under the e-Lib programme (Law, 1997). The rapid changes in the UK student population in the 1990s and beyond saw more universities and the growth of higher education within further education colleges. Sometimes the library changed its title to the 'learning resource centre'. Greater investments in electronic information services meant that students had to be encouraged to use the newer electronic information services and there was a shift in emphasis towards user training (Hepworth, 2000) and information literacy programmes (Owusu-Ansah, 2001) and their evaluation (e.g. for the UK, by Streatfield and Markless, 2008). The performance of academic libraries was frequently assessed in terms of service quality expectations (LibQUAL™ framework). The emphasis is on outcomes rather than internal processes. The balanced scorecard framework for performance assessment, which does include a criterion for internal processes, has been used much less – an example from Finland uses the 'internal processes' to assess the effectiveness of co-operation activities in a university library consortium (Kettunen, 2007). Town (2004) suggests that the processes of interest for a balanced scorecard for internal processes for the academic electronic environment should include the project management perspective, for handling new services. The absence of discussion of processes in academic libraries from the peer-reviewed journals does not mean that there are no concerns – occasional mentions in conference literature (e.g. Webb and Galloway, 2000) suggest that there may be some more internal reports (e.g. Stanford University's approach to business process redesign, Stanford University, 2005)

### **3.3 Systematic approaches to examining academic library operations**

Recent evidence is that there is an apparent lack of interest in process analysis within academic libraries (Lakos, 2007), since analysis of electronic journal usage statistics, for example, can be time consuming and the task is more complex than it might appear (Conyers and Dalton, 2007).

More systematic approaches to examining library operations may be emerging. Unlike the earlier operations research, these explore the human roles and responsibilities in far more depth. An early indicator of this trend (Lewis, 2001) examined the role of the electronic resources librarian, with some indication of the workflows and how some of the responsibilities fitted together. Similarly, Ehrlich and Cash (1999) conducted an in-depth examination of the work of information intermediaries and how their support tools were used in their work. Youngman (2006) states that, "process flow analysis is a technique commonly used in industry, but, when used as a management tool in academic libraries, it can enhance the effectiveness of existing resources and justify additional resources"

Guise (2005) suggests a systematic approach to assessing service models for reference and instruction programmes. Kennedy (2005) examined how digitisation affected workload, staffing and outsourcing in preservation. McKiernan and Ohler (2006) also discuss some of the changes to traditional technical services, and workflows are mentioned (but not discussed or charted). Similarly Schwartzkopf (2007) reports a presentation by Amanda Yesilbas on changes to the workflow for e-journal check-in, but with only an outline description of the process. Capture of organisational learning and knowledge sharing requirements are proposed by Daneshgar and Parirokh (2007).

### **3.4 Applications of process analysis in other university functions**

Most business process modelling has focused on commercial organisations and publication of modelling work within universities. Ould (2005) gives some examples in a book on business process modelling using the Role Activity Diagram (RAD) and Process Architecture Diagram approach. Another recent example of the use of a RAD approach is a demonstration of the process of selection, enrolment and registration for research students and a comparison with a Unified Modelling Language (UML) approach. This indicates the superiority of the RAD approach in notations for goals,

process activation, data flows, interaction between roles and pre-existing roles (Odeh et al. 2003).

## **4 Conclusion**

It has been tempting to conclude that, “Business Process Modelling comes to the rescue” (Havey, 2005) and that identification of task, role and knowledge artefacts will enable collaboration, “confirmed by the library manager as part of the development and validation processes” in academic libraries (Daneshgar and Parirokh, 2007). However, the comparison of models by Lin shows that gaps have existed in previous methods (Lin et al., 2002). The way ahead for the current study will be based on RAD (and associated Riva data capture, Ould, 2005) since it offers benefits drawn from large-scale studies, capable of being applied and analysed within small cases. This basis also offers an integrity that less explicit modelling does not.

## **References**

Akeroyd, J. (2001) *The future of academic libraries*, Aslib Proceedings, 53 79-84.



- Bensman, S. J. (2005) *Urquhart and probability: the transition from librarianship to library and information science*, Journal of the American Society for Information Science and Technology, 56 189-214.
- Chaturvedi, D. (Ed). (1994) Academic Libraries, Anmol, New Delhi.
- Cogswell, J. A. (1987) *The organisation of collection management functions in academic research libraries*, Journal of Academic Librarianship, 13 268-276.
- Conyers, A and Dalton, P. (2007) *Electronic resource measurement: linking research to practice*, The Library Quarterly, 77 463-470.
- Corrall, S. (1995) *Academic libraries in the information society*, New Library World, 96 35-42.
- Daneshgar, F. and Parirokh, M. (2007) *A knowledge schema for organisational learning in academic libraries*, Knowledge Management Research and Practice, 5 22-33.
- Ehrlich, K. and Cash, D. (1999) *The invisible world of intermediaries: a cautionary tale*, Computer Supported Cooperative Work, 8 147-167.
- Guisse, J. L. (2005) *Toward a template for systematic reference and instruction programme analysis*, New Library World, 106 29-42.
- Havey, M. (2005). Essential Business Process Modelling, O'Reilly, Sebastopol CA.
- Hepworth, M. (2000) *Approaches to providing information literacy training in higher education: challenges for librarians*, New Review of Academic Librarianship, 6 21-34.
- Kennedy, M. R. (2005) *Reformatting preservation departments: the effect of digitization on workload and staff*, College and Research Libraries, 66 543-551.
- Kettunen, J. (2007) *The strategic evaluation of academic libraries*, Library Hi-Tech, 25 409-421.
- Lakos, A. (2007) *Evidence-based library management: the leadership challenge*, Portal: Libraries and the Academy, 7 431-450.
- Lancaster, F. W. and Cleverdon, C. W. (1977) Evaluation and scientific management of libraries and information centres, Noordhoff, Leyden.
- Law, D. (1997) *National library initiatives: the UK higher education experience*, Journal of Academic Librarianship, 23 127-131.
- Lewis, D. W. (2007) *A strategy for academic libraries in the first quarter of the 21st century*, College and Research Libraries, 68 418-434.
- Lewis, N. (2001) *Redefining roles: developing an electronic journals collection at the University of East Anglia*, Information Services and Use, 21 181-187.

- Lin, F-R., Meng-Chyn, Y. and Pai, Y-H. (2002) *A generic structure for business process modelling*, Business Process Management Journal, 8 19-41.
- McKiernan, G. and Ohler, L. A. (2006) *The keys to successful change management for serials*, The Serials Librarian, 51 37-72.
- Odeh, M., Beeson, I., Green, S. and Sa, J. (2003) *Modeling processes using RAD and UML activity diagrams: an exploratory study*, paper presented at the 3<sup>rd</sup> International Arab Conference on Information Technology, ACIT2002, Doha, Qatar, 16-19 December 2003.
- Ould, M. (2005) *Business process management: a rigorous approach*, Swindon, British Computer Society.
- Owusu-Ansah, E. K. (2001) *The academic library in the enterprise of colleges and universities: toward a new paradigm*, Journal of Academic Librarianship, 27 282-294.
- Ranganathan, S. R. (1931) *The five laws of library science*, Madras Library Association, Madras and Edward Goldston, London. Retrieved January 21, 2009 from Digital Library of Information Science and Technology, <http://dlist.sir.arizona.edu/1220/>
- Rau, E. P. (2007) *Managing the machine in the stacks: operations research, bibliographic control and library computerization, 1950–2000*, Library History, 23 151-168.
- Reid, B. (2000) *Organisational models for managing academic information*, Achieving cultural change in networked libraries. (Eds, Reid, B. J. and Foster, W.) Gower, London, pp. 15-26
- Rowley, J. E., and Rowley, P. J. (1981) *Operations research: a tool for library management*, ALA, Chicago.
- Schwartzkopf, B. (2007) *Old is new again: using established workflows to handle electronic resources*, Serials Librarian, 52 277-280.
- Shim, W. (2003) *Applying DEA technique to library evaluation in academic research libraries*, Library Trends, 51 312-332.
- Stanford University (2005) *Process changes discussion*, In Stanford University Libraries Redesign Report, Retrieved January 21, 2009 from <http://library.stanford.edu/depts/ts/about/redesign/report/sect8.html>
- Streatfield, D. and Markless, S. (2008) *Evaluating the impact of information literacy in higher education: progress and prospects*, Libri, 58 102-109.
- Tedd, L. A. (2007) *Library management systems in the UK: 1960s-1980s*, Library History, 23 301-316.

- Town, S. (2004) *E-measures: comprehensive waste of time*, VINE: The Journal of Information and Knowledge Management Systems, 34 190-195.
- Webb, J. and Galloway, L. (2000) *The voice of the process: process management and performance measurement of collection development activities in a new university library*, In Proceedings of the 3<sup>rd</sup> Northumbria International Conference on Performance Measurement in Libraries and Information Services, Value and Impact, 27-31 August 1999. Information North, for School of Information Studies, Northumbria University, Newcastle-upon-Tyne, pp. 125-130.
- Wilson, K. M. and Halpin, E. (2006) *Convergence and professional identity in the academic library*, Journal of Librarianship and Information Science, 38 79-91.
- Youngman, D. C. (2006) *Process flow analysis in academic libraries*, Technical Services Quarterly, 24 37-44.

## ***Appendix 7: Paper submitted to Library Management Journal***

### **Library Management, 31 (7)**

#### **Using business process modelling to examine academic library activities for periodicals**

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##### **Abstract**

**Purpose** – The paper's purpose is to examine the process for the acquisition of print and electronic periodicals acquisition process in academic libraries using a business process modelling technique, role activity diagram (RAD).

**Design/methodology/approach** – A literature review examined process modelling in academic libraries. Multiple methods were used for data collection, including documentary analysis, and interviews ( $n=8$ ) with library staff (mostly recorded) provided other details about the library processes. Two sites were studied. Direct observation was used occasionally as a less formal method. RAD was used as a modelling technique; this is part of the Riva business process-modelling suite (Ould).

**Findings** – The role activity diagram examples illustrate the differences in processes between the sites and the paper explores how they were used to discuss comparisons and possible improvements with the library staff. In many ways this is a type of action

research study, as discussions with the research participants and ongoing evaluations are integral to the research.

**Research limitations/implications** – This work is limited to one process in academic libraries; periodical acquisitions. It is also limited to two cases, although these are two contrasting sites, one in the UK and the other in Jordan.

**Practical implications** – The modelling technique used was feasible, and provides a basis for improvement and management by supporting the analysis of process performance and behaviour.

**Originality/value** – A particular important aspect in bridging the gap between research and practice is communication, through presentation of information in a structured way – the pictorial representation in the business process analysis is used to assist in discussions between researchers and practitioners.

**Article Type:**

Case study

**Keyword(s):**

Process management; Academic libraries; United Kingdom; Jordan; Modelling; Serials.

## **1. Introduction**

Academic libraries have been described as a major source of information for researchers and many other users. In academia, the library is a supporting tool to the organisation's mission. The collection it embraces and the services it provides reflect changes and progress in research in that institution. According to Ranganathan's fifth law of library science (1963), the library is “a growing organism”, which leads to the common belief that libraries are dynamic systems or organisms where information acquisition, collection and leverage are dynamic too. This means that not only knowledge should be processed, but also, new information and knowledge should be

created. Academic libraries can be referred to as systems of integrated activities and business processes that collaborate-together to achieve organisational goals (Danshgar and Parirokh, 2007). This implies that business process modelling techniques are applicable to the study of academic library functions.

This paper emerged out of the researcher's interest in modeling processes in academic libraries for analysis and improvement purposes. This work will look at one example of those processes, which is periodicals acquisitions – both print and electronic. Periodicals are a major source of information, the internet revolution has brought electronic periodicals into libraries collections, therefore, the need for acquiring, managing and archiving these resources is becoming inevitable. The case study used for this work is part of the real life process in two academic libraries, one in the UK and the other is in Jordan. The objective is to visualize and model the periodicals' acquisition process in academic libraries using role activity diagram (RAD). The underlying motive is to reveal any underlying features that could imply process improvement through modelling and analysis of the process, and to provide an alternative to the traditional approach of management review of library functions.

## **2. Framework**

Ranganathan (1963) identified five laws of library science; which provided an insight to the framework for this paper, these laws are:

1. Books are for use.
2. Every reader his or [her] book.
3. Every book its reader.
4. Save the time of the user.
5. The library is a growing organism.

Relating these laws to periodicals one could say: Periodicals are for use and therefore they should be accessible, every reader his or her periodical: access to full text (through link resolvers) or current issue displays for browsing; every periodical its reader: cost per use needs to be considered (e.g. for electronic periodicals download cost per number of uses, save the time of the user: when searching for periodicals whether by providing full text links or by ordering an interlibrary loan. Finally; the library is a growing organism; this means that libraries are dynamic, changes are

taking place, particularly in hybrid libraries managing print and electronic resources and the need to manage the change is crucial when academic library and information services are also responsible for learning management systems/virtual learning environments.

The Ranganathan framework serves to encapsulate the mission of the library – with adaptations to the laws for the digital environment. The advantage of the Ranganathan framework is that both the library user and library staff perspectives are represented.

### **3. Literature review**

Control and management of the information was a concern of the scientists as well as the library managers and more scientific approaches to library operations developed. Rau (2007) discusses three 1960s-1970s examples that included use of Poisson modelling, queuing theory, Monte Carlo and other simulation techniques.

Very little work has taken place exploring modelling of academic libraries processes, as far as the published literature is concerned – such material may be in internal reports, therefore the absence of discussion of processes in academic libraries from the peer-reviewed journals does not mean that there are no concerns –occasional mentions in conference literature (e.g. Webb and Galloway, 2000) suggest that there may be some more internal reports (e.g. Stanford University's approach to business process redesign, Stanford University, 2005)

Liu *et al.* (1999) presented a paper in which they studied the legacy system behaviour; the case study chosen was Staffordshire university library. Various software engineering and semiotic techniques were used, including RAD, which was used to model the process of checking out a book in the library. Modelling that process was part of understanding the system's requirements which could therefore be used to enhance the legacy system or integrate it with other parts of the information system.

In another work, Khan *et al.* (2006) investigated the process of a scientific publishing process for digital libraries. The process was modelled using RAD. The aim of their research is to bridge the gap between business process modelling and grid computing as business process modelling languages such as RAD has limited applicability in

terms of enactment over distributed systems although it provides great flexibility for modelling business behaviour.

Moreover, from the data collected in the two UK university libraries for this research, internal documents found that both libraries used workflow diagrams of some sort to model processes, and these included digitization and book ordering. This suggests that such modelling is done, but not published externally.

### ***3.1 Organisation and change: why rethink traditional library methods?***

Academic libraries are exposed to both internal and external factors, which cause organisational changes. Davies *et al.* (1992) consider how university libraries in the UK faced the problem of managing change during the 1980s. The change they discussed in their paper was the change from a traditional library to a library that follows a service-led strategy, where provision of services is given priority over resources collection. This change raised many issues such as the clash between the existing culture (the existing way of doing things) and the demands of a new service-led strategy. They conclude that there are usually key areas in some organisations in which mismatches exist. These gaps often happen to be between the strategies stated and the actual way of doing things (culture or reality). If such areas were identified, then it would be easier to manage change as these areas may then be targeted for improvement. For example; they found that the management strategy of “operating the library as academic support service” was not clearly understood by many staff in the university library studied and it was even opposed by others. This suggests that serious attention should be given to such strategy to improve its chance of successful implementation. A service-led strategy needs to be accompanied by processes that match the strategy.

After the internet revolution, the trend of electronic resources, especially e-journals, started to replace the physical ones, this major change has aroused challenges within academic libraries, challenges concerning managing those virtual items, their licensing and archiving (Kulp and Rupp-Serrano, 2005). As libraries have experienced considerable evolution over time, acquisitions departments within libraries were the first to be exposed to changes as they act as the interface between the library and the marketplace (Bordeianu *et al.*, 1998). Changes achieved in



acquisitions can provide a solid base and a fertile ground for whatever changes to be undertaken within the library as a whole (Gleason and Zeugner, 1998).

Much research has been carried out on how to manage different types of change in academic libraries and to embed innovation. For example, Atkinson (2003) used PEST (Political, Economic, Social and Technological factors) analysis to deal effectively with changes in the strategic operating framework. Another example of the issues being faced these days in academic libraries is the issue of space management, which is a major resource that has to be developed in any university library to convey the changes happening in higher education such as the increase use of group learning and the highlighted role of computer and technology in learning and research.

The debate about library spaces started in individual libraries, when they started fundamental evaluations of their space use (Houlihan, 2005). However in Ranganathan's book (1963), the main parts of the library that are capable of growing were discussed, these being the books, the staff and the readers, and he referred to them as: the "trinity". Ranganathan paid attention to the growth in size problem years ago. An example study at Loughborough University library was undertaken in 2006 using user surveys, to explore learner's demands and expectations for space. The aim of the study was to find out how space is perceived by library users (Walton, 2006).

### ***3.2 Improvements in libraries***

Academic libraries are now operating in a very different environment, technologically and economically, to that prevailing ten or more years ago. Typically, as Juntunen *et al.* (2005) note, the main change is the provision of access to resources, from physical premises directly to user's desks and workrooms, and at the same time the amount of electronic publication has increased exponentially.

In the Netherlands, the IWI consortium (which is translated as Innovation of Academic Information Services) started 14 projects. One of them was targeted at the development of university libraries, and involved the performance of a quality audit. The project started in 1998 and was restricted to six university libraries. The method used was benchmarking (as quality management instrument), while the instruments used included 24 performance indicators for the quantitative aspects and questionnaires for aspects that need user opinions. The project concluded that

benchmarking indisputably played a major role in improving the funding and the performance of Nijmegen University library, in which local implementation of the results was carried out for this work. (Laeven and Smit, 2003). Although benchmarking helps to question ways of developing products and services, process modelling is a more structured way of involving staff and it helps to see the implications of performing activities in different ways, it makes processes more visible and revealing. It is also considered to be the fundamental re-thinking and radical design of business processes as noted by Luo and Tung (1999).

### ***3.3 Business process modeling (BPM)***

Nowadays, business organisations are being described in terms of processes rather than functional hierarchies. Business processes refer to the workflow within an organisation or a company, the processes and the transactions involved within the enterprise. “When a business analyst stands sketching the flowchart of a business process as a cluster of boxes linked by arrows and asks the software team to make it run, business process modelling comes to the rescue. BPM is a set of technologies and standards for the design, execution, administration, and monitoring of business processes” (Havey, 2005).

Processes comprise activities and interactions undertaken by people and machines to achieve the organisation's goals, and when analyzing those processes, requirements for computer-based system can be derived (Green, 2004). The basic concepts in process modelling include: roles, activities, entities and interactions, where roles are composed of activities that work on entities and these entities communicate and collaborate through interactions (Ould, 1995).

There are various methods for modelling business processes. Each method employs a set of notations that represent business processes from different perspectives. Rosemann (2006) argues that process mapping and flowcharting have been around to visualise a business process for a long time, one of these being the flow charts developed by Goldstine and Neumann in 1946, which became the basis of all programmers' work at that time (cited in Morris and Gotel, 2006). However, terms have changed. Analysts nowadays prefer the term process modelling rather than mapping or flowcharting.

One crucial part of business process modelling is the representation and enacting of business processes. Research conducted in this area indicates the importance of BPM. From the software engineering point of view, for example, Curtis *et al.* (1992) suggested that BPM provides a common representation of processes which facilitates groups' understanding, and it also acts as means of communication. In addition, by analyzing and supporting process behaviour, BPM can serve as a basis for process improvement, which is an aim of the research described here.

Similarly, Huckvale and Ould (as cited in Luo and Tung, 1999) suggested that BPM could provide a means for communicating, discussing and analyzing existing processes, an avenue for designing new ones, a baseline for improvement and controlling. Both groups argued that having multiple objectives for using process modelling requires choosing suitable method from different modelling methods, according to their properties and characteristics.

#### **4. Riva as a modelling method**

Viewing business processes from behavioural/rganizational perspective urges the “role” to be focused on. Although the term “role” existed theoretically in social science in the 1920s, it is in 1970 when sociological role theorists defined a role in terms of behaviour. However, a role in computer science is a modelling technique that is used to specify the responsibilities of a business object. In other words, a business object plays roles in a business process when participating in different activities (Caetano *et al.*, 2005).

When discussing processes, whatever the field is, a language is needed to define, record and talk about those processes. Riva is one example of analysis method based on the concept of “role”. Ould created and adopted the development of Riva method in business process modelling field. Ould (2005) defines Riva as “a method for the elicitation, modelling, analysis and design of organisational processes”. Riva uses two languages to represent and discuss processes: the process architecture diagram (PAD) and the Role Activity Diagram (RAD).

While PAD refers to the overall chunking of all organisation's activities into processes, RAD however is a technique for process modelling which embraces roles as main component. It looks at individual processes within an organisation and shows

roles, their activities and interactions. Ould (1995) defines a role and activities as follows: “A role is a set of activities which, taken together, carry out a particular responsibility or set of responsibilities”. “Activities are what actors do as ‘individuals’ in their roles”. A role can take many forms such as: functional position or post like administrator, functional group like a library IT team, a class of person like a customer, and an abstraction like progress tracking.

RAD has been used in the literature in various fields to model processes and to derive problem frames in a business process, examples of such studies are: Dawkins (1998), Rojas and Martínez (1998), Beeson *et al.*(2002), Odeh *et al.*(2003), Cox and Phalp (2003). RAD has also been included in different comparisons or studies that provided generic framework for selecting a business process method, such as Lin *et al.*(2002). As RADs can be used to explore features that will enable further improvement of the current process, it is advised to apply this method in this research on academic libraries in order to make librarians rethink about what they function. Setting “analysis” as an objective leads to choosing the “role perspective” for viewing processes, consequently; using RADs as they are a very good example of process modelling method from a role perspective.

As mentioned previously, RAD shows the roles participating in a process, along with their activities and the interactions between these roles. Please refer to Figure 1 for viewing RAD notations. Following is a summary of justifications for using RAD in this research:

Setting “analysis and improvement” as an objective leads to choosing the “role perspective” for viewing processes (Luo and Tung, 1999).

Viewing business processes from behavioural/organisational perspective makes the “role” a good focus here, as staff can relate to the ideas of responsibilities (who does what) (Luo and Tung, 1999).

RAD is a modelling technique from “role” perspective which can be used to explore features that will enable further improvement of the current process.

## **5. Methodology and techniques**

An embedded multiple case study design was used. The cases discussed here are: a university library in the UK and a university library in Jordan. The selection of the cases is based on the fact that the researcher is based partly in Jordan and partly in the UK for doctoral research studies. As such work requires some sort of establishment of trust – which takes time – it limited the researcher to cases where she was known and could therefore gain access. Moreover, the selection of two contrasting sites with different systems allows some comparison of the ways processes are organised, as shall be seen later in the results, it also provides more scope for discussion about the reasons for certain responsibilities and actions.

The methods used in data collection included:

Documentary information such as reports, internal records, statistical reports, newspaper clippings and articles appearing in the media for the site under study.

Interviews ( $n=8$ ) with library staff to learn about library processes, Interviews were scheduled with individuals via email, the range of the interview's length varied between 30 to 75 minutes, they were all anonymous. Interviewees were selected from various hierarchal level and they were not identified in this work. The information gathered was kept securely and only for analysis and modelling purposes. The type of interviews conducted was semi-structured of an open ended nature; interviewees were asked specific but flexible questions and were also given the chance to propose their insights, in addition to that; questions were prone to changes according to information provided by the interviewees. Yin (2003) states that in open-ended interviews; one may use the interviewees' propositions as the basis for further inquiry, the respondent can also suggest other persons to be interviewed as well as the source of evidence.

Direct observation was used occasionally as a less formal method.

Role activity diagram (RAD) is used; this is part of the Riva business process-modelling suit (Ould, 2005). Visio 2007 (Microsoft Office) is the tool used to apply the RAD. It is an appropriate tool to model processes; “Visio is designed to be a top notch commercial drawing tool” (Godfrey, 2007). There are other tools that are used to prepare role activity diagrams, they might use slightly different symbols, however, the meaning is what really matters.

### **5.1 What does RAD offer?**

RAD offers a common process representation that facilitates understanding of the process.

It is an analysis method that can be documented for further work or for any new appointed staff.

It can serve as a basis for improvement and management by supporting the analysis of process performance and behaviour.

It is flexible in drawing and it offers multiple useful features like triggers, iteration and deadlines. This might throw the analyst's attention when time is vague or undetermined in the process.

Looks at activities – can some be done in parallel to save some time?

RAD reveals features, not solves problems. It acts as a searchlight, reveals problems and suggests potential ways of attacking those problems, sometimes it's very clear but at other times much more effort is needed to reveal it (Ould, 1995).

After listening carefully to the interviews and identifying the activities and actors involved in the process of periodicals' acquisitions, RADs for each university library were produced. Section 6 introduces role activity diagrams for the selected cases. According to the data collected it was learnt that periodicals' acquisition process for both print and electronic periodicals can be presented in the same model as the same people (actors) are involved in the process and they do essentially the same job for ordering both print and electronic periodicals. However; things are different in the other university library in Jordan, where three models were created for periodicals' acquisition process; two for electronic periodicals (depending on who initiates the process: the provider or faculties), and one for print periodicals (usually magazines or newspapers).

### **6. Role activity diagrams**

These are shown in Figures 2-5.

### **7. Results**

The diagrams represent periodicals' acquisition process in two university libraries, one in the UK and another in Jordan. The models illustrate some differences between the two contrasting sites such as the way each library deals with the process. In the UK library for instance, it is only academics who initiate the process. Moreover; the acquisitions team within the library is responsible for periodicals' acquisitions, and other library materials, whether it is electronic or in a print format. On the other hand, in the Jordanian library, while acquiring print periodicals starts with providers who approach the University to present offers; electronic periodicals acquisition however starts by either faculty representative requesting titles or providers presenting their offers through the consortium centre. In addition, the Serials Division in this Jordanian library is separated from the acquisition department, while the former deals with only periodicals, the latter deals with books, unlike the UK university library, where the structure is different, as it has got a merged books and periodicals acquisition department. Another spotted difference between the two sites is the vital role of library administration within the Jordanian library in approving titles selection or at least making sure orders go through library administration first, while in the UK library, acquisitions seems to have some sort of stronger authority.

Examining the models raises some points and questions about the process:

*Complexity or insufficient sequencing.* Sometimes it is useful to avoid “waiting for approval”. Instead of waiting for library administration approval after ordering the journal, sending a copy at the same time to both finance and library administration will save time and run the process more efficiently. Also, for the UK library, the order is sent to the assistant director for signature, is not it time to minimize the paper work?

*When is the right time or what is the right number of requests that shall make the serials division proceed with the order?* When the serials division in Figure 4 receives requests from faculties, they carry out titles unification, this means they wait till they have sufficient number of titles, how do they decide it is enough? And what if a faculty needs the journal urgently? That will delay the process.

*Communication problems.* In Figure 3 where there is a communication between the publisher and the consortium centre; what is the best way of communication? Knowing that the centre is based in another city that is one hour and 15 minutes drive

from the university studied, meetings are not very easy to schedule. How about video conferencing?

*Looking at the initiator.* For the UK library, having the department representative initiating all the time makes you wonder – should not the library be open to deals offered by other providers or publishers directly?

*Unnecessary tasks.* Unnecessary tasks such as faculty representatives approaching library administration first in Figure 4 –they can go straight to the serials division for ordering journals, especially if the budget is pre-determined.

There are factors that affect the quantitative behaviour of the process (Ould, 1995), and these can be concluded from interviews or from the setting itself, these are:

The number of staff carrying out activities.

Seasonal work – how does intensity of activity vary during the year

The availability of tools and other resources needed in some roles.

Economic and currency situation, in addition to the increase of journal prices.

## **8. Conclusions**

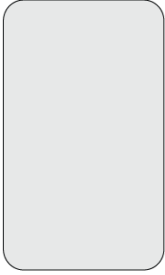












The paper has demonstrated that the modelling of processes for periodicals' acquisition in academic libraries demonstrates clearly the differences between two libraries. Such differences help to question the validity of doing things in a particular way. In addition, by closer inspection of the activities within one set of processes some of the bottlenecks are more obvious and suggestions can be made to streamline processes.

The modelling technique used is feasible, and relatively simple, it is a graphic way of modelling and re-engineering library processes as it provides a basis for improvement and management by supporting the analysis of process performance and behaviour. RAD possesses “pictorial” value as a modelling method. A particular important aspect in bridging the gap between research and practice is communication, through presentation of information in a structured way – the pictorial representation in the



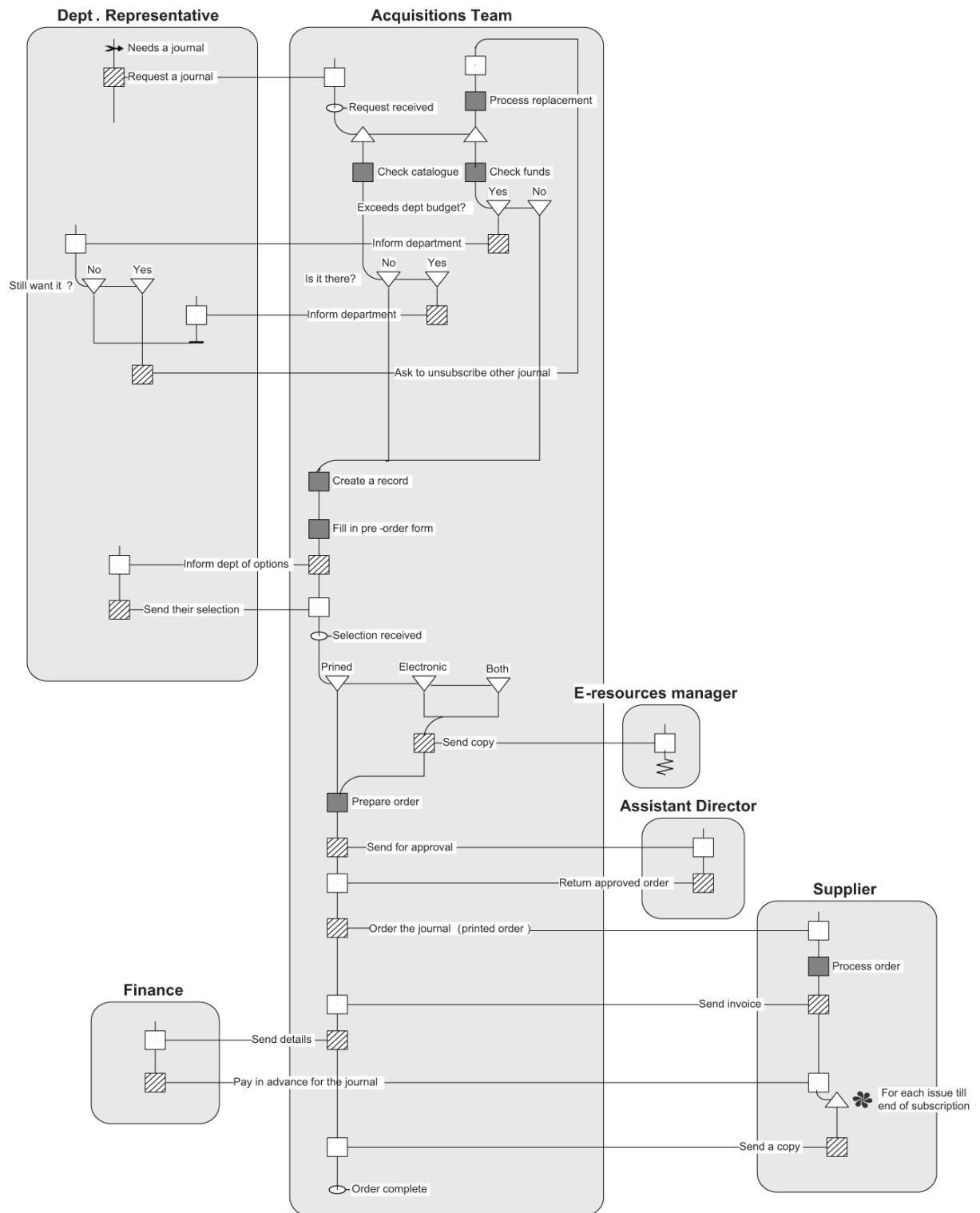
business process analysis is used to assist in discussions between researchers and practitioners.

The modelling could be applied to other activities within academic libraries, with similar aims for process improvement. On a larger scale, the interactions between the sets of processes become more important. For example, increased electronic access to journals has affected interlending activities within academic libraries. For the “big picture” the process architecture may be important, and that is another part of the R/VA methodology.

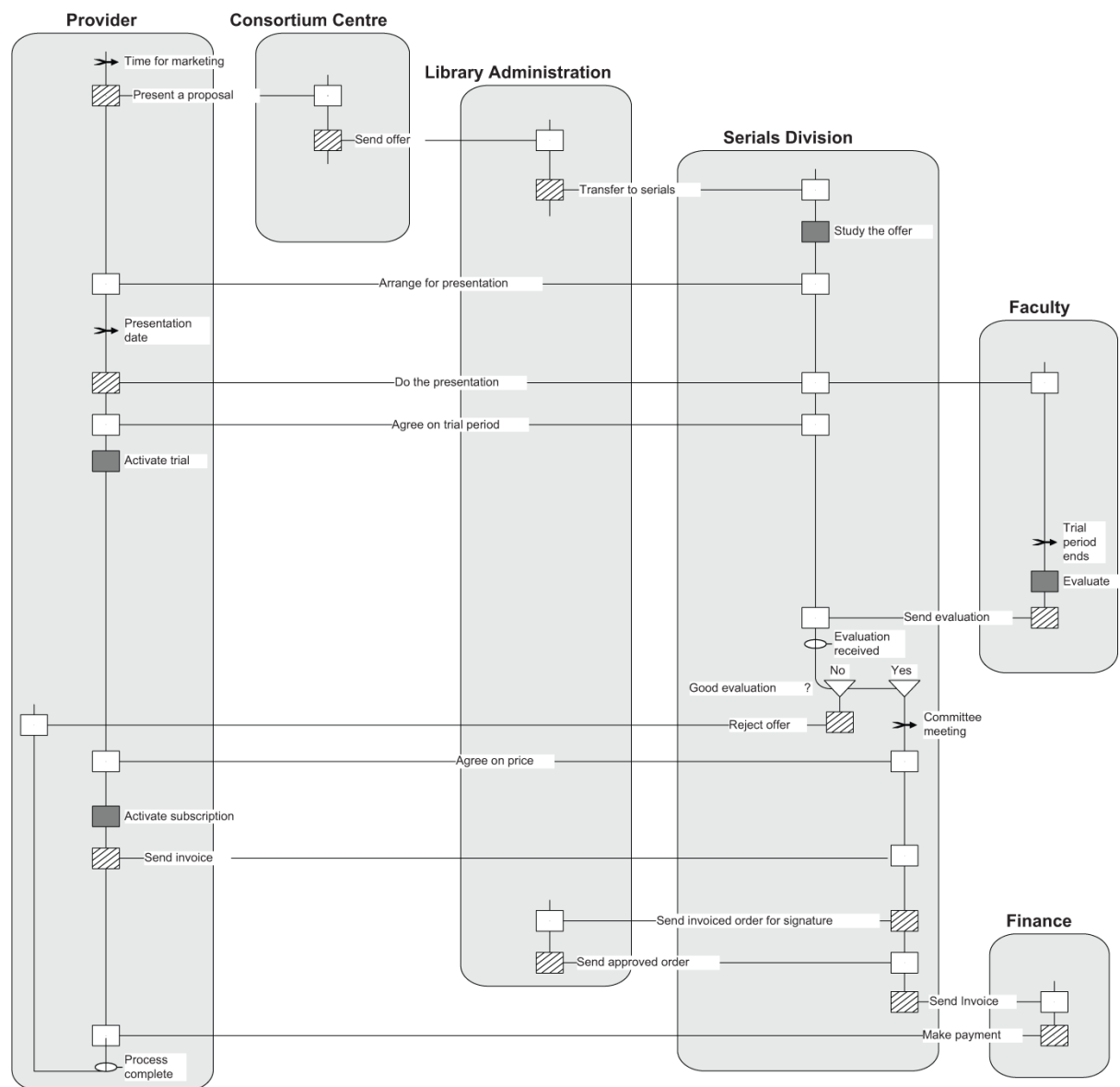
	A role. Example: acquisitions team, or library director A role.
	An action. Example: prepare presentation
	Start another role. Example: start new designer
	Driver part-interaction. Example: order book
	An interaction.
	Interaction between two roles. Example: negotiate price
	A state description. Example: order complete
	A state.
	A trigger. Example: start of academic year
	Case refinement: alternative paths depending on the condition. Example: budget exceeds 2000? Ye/No
	Part refinement: concurrent paths (to represent things done in parallel).
	Replication. Example: for each book
	Don't care what happens then.

**Source:** Microsoft Office (2010)

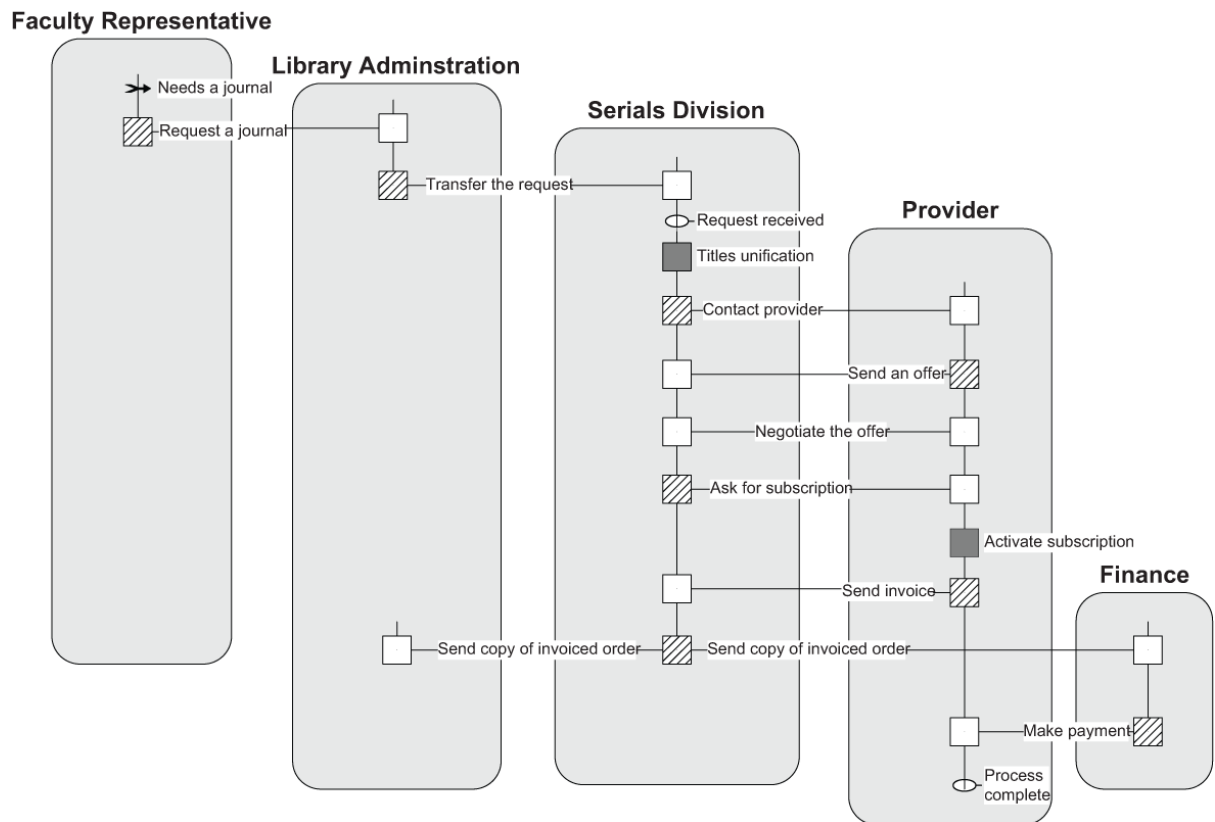
**Figure 1** RAD notations, from Visio; the modelling tool used in this research



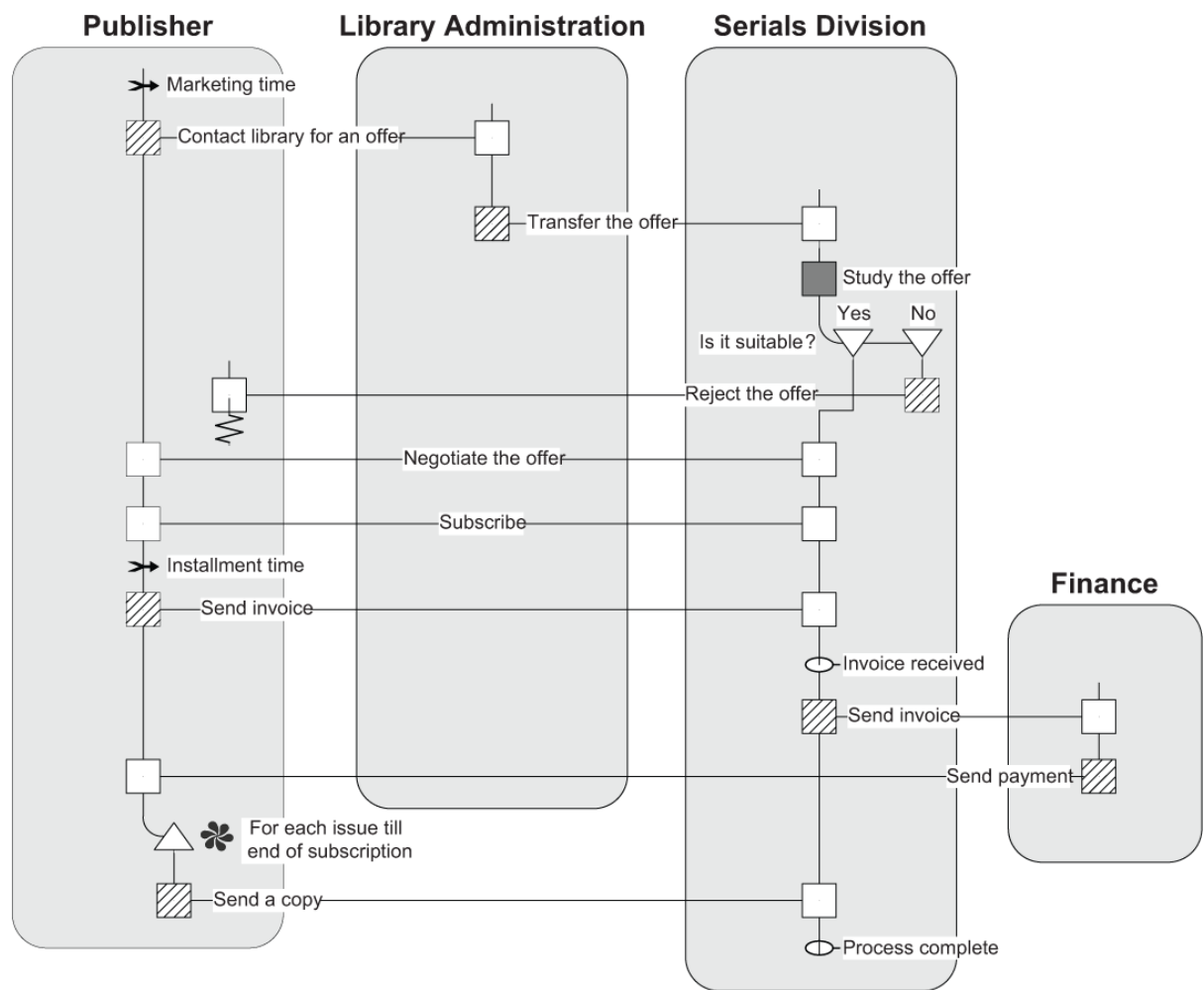
**Figure 2** RAD for electronic and print periodicals' acquisitions process in the UK university library



**Figure 3** RAD for electronic periodicals' acquisitions process in the Jordanian university library, with the provider initiating the process



**Figure 4** RAD for electronic periodicals' acquisitions process in the Jordanian university library, with the faculties initiating the process



**Figure 5** RAD for print periodicals' acquisitions process in the Jordanian university library

## References

- Atkinson, J. (2003), "Managing change and embedding innovation in academic libraries and information services", *New Review of Academic Librarianship*, Vol. 9 No.1, pp.25-41.
- Beeson, I., Green, S., Sa, J., Sully, A. (2002), "Linking business processes and information systems provision in a dynamic environment", *Information Systems Frontiers*, Vol. 4 No.3, pp.317-29.
- Bordeianu, S., Lewis, L.K., Wilkinson, F.C. (1998), "Merging the acquisitions and serials department at the University of New Mexico: a case study", *Library Acquisitions: Practice & Theory*, Vol. 22 No.3, pp.259-70.
- Caetano, A., Zacarias, M., Silva, A., Tribolet, J. (2005), "A role-based framework for business process modeling", *Proceedings of the 38th Annual Hawaii International Conference on System Science, Big Island, HI*.
- Cox, K., Phalp, K. (2003), "From process model to problem frame", paper presented at 9th International Workshop on Requirements Engineering: Foundation for Software Quality –REFSQ'03, Velden, available at: <http://crinfo.univ-paris1.fr/REFSQ/03/papers/P10-Cox.pdf>.
- Curtis, B., Kellner, M., Over, J. (1992), "Process modelling", *Communications of the ACM*, Vol. 35 No.9, pp.75-90.
- Danshgar, F., Parirokh, M. (2007), "A knowledge schema for organisational learning in academic libraries", *Knowledge Management Research and Practice*, Vol. 5 No.1, pp.22-33.
- Davies, A., Kirkpatrick, I., Oliver, N. (1992), "The organisational culture of an academic library: implications for library strategy", *British Journal of Academic Librarianship*, Vol. 7 No.2, pp.69-88.
- Dawkins, S. (1998), "Role activity diagrams for safety process definition", *Proceedings of the 16th International System Safety Conference, Seattle, WA*.

Gleason, M.L., Zeugner, L.A. (1998), "Ways of change: an acquisitions department in the 1990s", *Library Acquisitions: Practice & Theory*, Vol. 22 No.3, pp.303-9.

Godfrey, M.W. (2007), "My little UML (tools) page", available at <http://plg.uwaterloo.ca/~migod/> (accessed 2 February 2010).

Green, S. (2004), "Requirements engineering: process architectures", Faculty of Engineering, Computing and Mathematical Sciences, University of the West of England, Bristol, working paper.

Havey, M. (2005), *Essential Business Process Modeling*, O'Reily, Sebastopol CA.

Houlihan, R. (2005), "The academic library as congenial space: more on the St Mary's experience", *New Library World*, Vol. 106 No.1-2, pp.7-15.

Juntunen, A., Ovaska, T., Saarti, J., Salmi, L. (2005), "Managing library processes: collecting data and providing tailored services to end-users", *Library Management*, Vol. 26 No.8-9, pp.487-93.

Khan, Z.A., Odeh, M., McClatchey, R. (2006), "Digital libraries: from process modelling to grid-based service-oriented architecture", paper presented at the 2nd International Conference on Information and Communication Technologies from Theory to Application (ICTTA06), Damascus, 24-28 April, available at <http://arxiv.org/ftp/cs/papers/0602/0602082.pdf> (accessed 22 May 2009).

Kulp, C., Rupp-Serrano, K. (2005), "Organisational approaches to electronic resource acquisitions: decision-making models in libraries", *Collection Management*, Vol. 30 No.4, pp.3-29.

Laeven, H., Smit, A. (2003), "A project to benchmark university libraries in The Netherlands", *Library Management*, Vol. 24 No.6-7, pp.291-304.

Lin, F-R., Meng-Chyn, Y., Pai, Y-H. (2002), "A generic structure for business process modelling", *Business Process Management Journal*, Vol. 8 No.1, pp.19-41.

Liu, K., Alderson, A., Qureshi, Z. (1999), "Requirements recovery from legacy systems by analyzing and modelling behaviour", *Proceedings of the IEEE*



*International Conference on Software Maintenance, IEE Computer Society, Washington, DC, pp.3.*

Luo, W., Tung, A. (1999), "A framework for selecting business process modelling methods", *Industrial Management & Data Systems*, Vol. 99 No.7, pp.312-18.

Microsoft Office (2010), *Visio 2007*, available at: <http://office.microsoft.com/en-us/visio/default.aspx?ofcresset=1> (accessed 2 February 2010).

Morris, S.J., Gotel, O.C.Z. (2006), "Flow diagrams: rise and fall of the first software engineering notation", in Barker-Plummer, Cox, R. and Swoboda, N. (Eds), *Diagrams*, available at: [www.springerlink.com/content/a626278184415554/](http://www.springerlink.com/content/a626278184415554/) (accessed 25 February 2010), pp.13-144.

Odeh, M., Beeson, I., Green, S., Sa, J. (2003), "Modelling processes using RAD and UML activity diagrams: an exploratory study", *Proceedings of the 3rd International Arab Conference on Information Technology, ACIT2002, Doha, Qatar, 16-19 December 2003*.

Ould, M. (1995), *Business Processes: Modelling and Analysis for Re-engineering and Improvement*, John Wiley, Chichester.

Ould, M. (2005), *Business Process Management: A Rigorous Approach*, British Computer Society, Swindon.

Ranganathan, S. (1963), *The Five Laws of Library Science*, Asia Publishing House, Bombay.

Rau, E.P. (2007), "Managing the machine in the stacks: operations research, bibliographic control and library computerization, 1950-2000", *Library History*, Vol. 23 No.2, pp.151-68.

Rojas, F., Martínez, A.I. (1998), "From process modelling to enactment and simulation", *Proceedings of the 12th European Simulation Multi-conference on Simulation – Past, Present and Future, 16-19 June*.

Rosemann, M. (2006), "Potential pitfalls of process modeling: part A", *Business Process Management*, Vol. 12 No.2, pp.249-54.

Stanford University (2005), *Process Changes Discussion*, Stanford University Libraries Redesign Report, Stanford University, Stanford, CA, available at: <http://library.stanford.edu/depts/ts/about/redesign/report/sect8.html> (accessed 21 January 2007).

Walton, G. (2006), "Learners' demands and expectations for space in a university library: outcomes from a survey at Loughborough University", *New Review of Academic Librarianship*, Vol. 12 No.2, pp.133-49.

Webb, J., Galloway, L. (2000), "The voice of the process: process management and performance measurement of collection development activities in a new university library", *Proceedings of the 3rd Northumbria International Conference on Performance Measurement in Libraries and Information Services, Value and Impact*, Information North, for School of Information Studies, Northumbria University, Newcastle upon Tyne, pp. 125-30, 27-31 August 1999.

Yin, R.K. (2003), *Case Study Research: Design and Methods*, Sage Publications, Thousand Oaks, CA.

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